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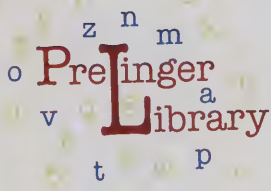

San Francisco, California
2008

75TH CONGRESS
1st Session

HOUSE OF REPRESENTATIVES

DOCUMENT
No. 140

PUBLIC WORKS PLANNING

MESSAGE

FROM

THE PRESIDENT OF THE UNITED STATES

TRANSMITTING

A PROPOSED PLAN OF A SIX-YEAR PROGRAM
SUBMITTED BY THE NATIONAL RESOURCES COMMITTEE
BASED ON SELECTION AND PRIORITY OF
PUBLIC WORKS PROJECTS

FEBRUARY 3, 1937.—Referred to the Committee of the Whole House on the state of the Union and ordered to be printed with accompanying papers and illustrations

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1937

LETTER OF TRANSMITTAL

To the Congress of the United States:

During the depression we have substantially increased the facilities and developed the resources of our country for the common welfare through public-works and work-relief programs. We have been compelled to undertake actual work somewhat hurriedly in the emergency. Now it is time to develop a long-range plan and policy for construction—to provide the best use of our resources and to prepare in advance against any other emergency.

In a previous message, I have suggested a permanent planning agency under the Chief Executive in order that, among other things, all public works proposals may filter from the many individual departments and bureaus to a central planning place and thence to the President.

I have also suggested to the Congress that following this course of planning the President will annually submit to the Congress a list of projects which have been studied and approved and, at the same time, inform the Congress, through the Budget, of the total amount of Federal funds which, in his judgment, should be appropriated for public works during the following fiscal year.

The list of public works submitted by the President in the Budget message would, of course, be wholly advisory, for it is within the discretion of the Congress to eliminate projects from this list, to alter the scope of projects or to add other projects.

The report of the National Resources Committee on public works planning which I submit today should, of course, be read in conjunction with the recommendations for highways, bridges, dams, flood control, and so forth, already under construction, estimates for which have been submitted in the Budget, and also should be read in conjunction with other special reports, such as the report of the Great Plains Committee which I expect to submit to the Congress in a few days.

The National Resources Committee submits a 6-year program, based on selection and priority of public works. The period of 6 years is arbitrarily chosen and can, of course, be made to fit into annual future appropriations made by the Congress.

The report also contains recommendations on the timing of public works and division of costs in their relation to the necessary organization of future continued planning. I have already referred to this in my message relating to the reorganization of the Executive branch of the Government.

As an example of the kind of reservoir of projects constituting the 6-year program, a drainage basin study is included in the report. This summary list of projects involving the uses of water is not to be regarded as fixed or final, as the report itself notes, but rather indicates a great forward step in the development of the planning process, considering not one project alone but the relationships between a great group of projects dealing with water use and control.

Through the formulation and annual revision of a program of all types of construction, revision and adoption of the program by Congress and appropriations under regular budgetary procedure timed in part in relation to economic needs we can provide for the orderly development of our resources and the provision of needed facilities for our people.

FRANKLIN D. ROOSEVELT.

THE WHITE HOUSE,
February 3, 1937.

National Resources Committee

Interior Building

Washington

December 1, 1936.

The President,
The White House.

My Dear Mr. President:

We have the honor to transmit herewith a report of the National Resources Committee on Public Works Planning.

This report recommends a proposed policy for planning, programming, timing, and division of costs of public works. These recommendations are based on special investigations by the Water Resources Committee on drainage basin problems and programs, by the Projects Division of the Federal Emergency Administration of Public Works on a 6-year program of Federal construction, and by a special research staff on division of costs of public works.

The report on Drainage Basin Problems and Programs, constituting part II of this statement, represents a first attempt through the joint efforts of Federal, State, and local agencies, official and nonofficial, to formulate a national water plan and program. Project lists embodied in that report provide a reservoir of undertakings intended to cover a period of 10 or more years. They have been selected as parts of the ultimate plan of development for the drainage basin in which they are located without reference to Federal or non-Federal financing.

This program should not be regarded as fixed or final. Year by year adjustments in it will be needed in the light of new knowledge, shifting needs, and perhaps altered policies.

The statements on the timing and division of costs of public works emphasize the need (1) for developing a long-time public-works policy, and (2) of relating this policy to business cycles or other crises. Procedures are laid down to avoid some of the past difficulties in the choice of projects, the timing of their construction, and the division of costs. As a means of organizing long-time public-works plans, we suggest:

1. A national development agency or public-works authority.
2. A panel of appraisers under this agency for allocation of costs.
3. A fiscal advisory committee to adjust public-works programs to the national needs for economic stabilization.

Sincerely yours,

Harold L. Ickes
Secretary of the Interior, Chairman

Harry H. Woodring,
Secretary of War.
Henry A. Wallace,
Secretary of Agriculture.
Daniel C. Roper,
Secretary of Commerce.
Frances Perkins,
Secretary of Labor.
Harry L. Hopkins,
Works Progress Administrator.
Frederic A. Delano.
Charles E. Merriam.

•

Henry S. Dennison
Beardsley Ruml.

Foreword

The American people, through their various governmental agencies, spent over three billion dollars on public works in 1930. Judging by past experience, it is plausible to assume that some thirty-odd billions of dollars will be expended for the development of our natural resources and for the provision of new facilities during the next 10 years through public-construction enterprises. How can we safeguard the wise investment of this large sum? How can we be sure that projects undertaken by local, State, and Federal agencies fit together into a comprehensive picture or program?

To assist in the formulation of a national public-works policy, the National Resources Committee (National Planning Board of the Public Works Administration 1933–34 and the National Resources Board, 1934–35) has assembled data and prepared studies on a number of the major aspects of the problem. Basing its statements on research reports made for it on Criteria and Planning for Public Works, by Russell Van Nest Black, Public Works in Prosperity and Depression, by Arthur D. Gayer, and Economics of Planned Public Works, by J. Maurice Clark, the National Resources Board in its report of December 1934 summarized the problem and made a series of recommendations.

Further studies in public-works planning, requested by the President, on division of cost and responsibility for public works, a 6-year program of public works, and the drainage-basin study have since led to the preparation of this report which is organized as shown by the accompanying table of contents.

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FREDERIC A. DELANO
Vice Chairman

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COLEMAN WOODBURY

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The National Resources Committee Recommends:

A. The Establishment of a National Public Works Policy based on:

1. *Unified plans for many-purpose projects.*—The conservation and wise development of our national resources involves continous study and collection of data by planning agencies at all levels of government—local, State, and Federal. These plans must be related to secure correlation of effort toward agreed objectives. Not only must the proposals of different units of government be correlated, but the different purposes of functions of separate projects must be adjusted and planned to avoid interference of one project with another while at the same time encouraging local initiative and responsibility. Nowadays most large-scale public works can or should be made to serve a number of purposes, but to ensure this requires forethought, planning, and correlation. The drainage basin report, constituting part II of this document, provides numerous examples of the problem and of ways to meet it through planning. The general problem is discussed on pages 7 to 9.

2. *Selection and analysis of projects.*—Experience with river and harbor appropriations has demonstrated the desirability of project analysis by technically qualified engineers before and supporting congressional action. The Emergency Public Works Administration has submitted all projects to analysis by engineers, lawyers, and a finance division. The same principle is applicable in relation to public works in other fields and among different types of projects. The criteria to be applied in the selection of desirable projects should include not only engineering soundness and financial, economic, or legal tests, but also conformity to larger plans in which the project plays a part, such as unemployment situations. Examples of the kind of criteria involved are given on pages 9 to 12 of this report together with suggestions for the procedures and organization through which these criteria can be applied.

3. *Advance programming of public works.*—Development of a consistent 5- or 6-year program of regular public works with annual revision, as provided in the act establishing the employment stabilization office, will provide a reservoir of selected projects which can be utilized in periods of economic depression. Annual revision of the program is necessary to secure orderly sequential relationships among related projects and to fit the program to changed conditions or new criteria. Unemployment conditions, financial status, fiscal policies, and similar considerations are involved. Experience of the Public Works Administration and Federal Employment Stabilization Board have amply proven that advance programs can be developed and that they are useful. A discussion of this subject is contained on pages 19 and 20 of this report.

4. *Revision and adoption by Congress of a 6-year program.*—It is properly an administrative function to propose a balanced program of public works—involving both budgetary and planning considerations, and it is for Congress to revise, modify, alter, and adopt a list of projects. This is the procedure now followed with river, harbor, and flood proposals and for public buildings. Congress approves projects in two categories—for construction or for study, and the approved lists cover work over a period of years. The control of approved projects rests entirely with Congress and the President, but the order of their construction is determined by the size of appropriations and the efficient conduct of the work. This procedure is applicable to other public works and should be extended to cover them.

5. *Timing* of public works in relation to other efforts toward economic stabilization involves large issues of fiscal policy. The committee recommends correlation of timing of public-works activities with other public fiscal policies through a fiscal advisory committee appointed by the President. This fiscal advisory committee would advise as to the manner in which public funds shall be provided to meet the expenses needed during any given period.

6. *Congressional appropriations* will, of course, determine the extent of the work to be undertaken in any fiscal year, and the existence of an approved 6-year program or list will facilitate the expansion or contraction of expenditures as the Congress may authorize. Again the experience with river and harbor work, with public buildings, and with public roads, is significant. Lump-sum appropriations for application to a list of approved projects or for expenditure in conformity with closely defined regulations have made possible much more efficient use of available funds than specification of fixed amounts for individual projects. Unexpected legal obstacles, overestimates and underestimates of cost, organization of engineering supervision, and similar factors, all argue for the lump-sum method of appropriation.

7. *Negotiation.*—Six-year programs for State and municipal public works are needed as well as a Federal program. In so-called normal times the volume of State and municipal construction is 6 to 10 times the Federal program. The correlation of Federal activities with regional, State, and local public works is important both for the full value of the works themselves and for the relationships among the projects in construction or operation. Several States and local governments have already adopted the practice recommended and now have 5- 6- or 10-year programs of public works or long-range financial programs for construction. State planning boards in all parts of the country are now preparing and revising State programs. (See sec. 3, p. 13.)

A second essential to establishment of working relations among Government units at varying levels to permit correlation of public works is agreement and adoption by legislative authorities of procedures for division of responsibility and costs. These matters are discussed in part III of this report with the conclusion that administrative negotiation of agreements within lines laid down by act of Congress is the only practicable method of procedure. A single agency to conduct the negotiations is needed to prevent unfairness or misunderstanding among the bureaus and agencies concerned. Grant of authority, by Congress, to a suitable single agency for these negotiations within broad limits is recommended. (See pp. 21–22.)

8. *Allocation to construction services.*—After adoption by Congress of a 6-year program of approved projects and appropriation of funds for 1 year's work, decisions must be made as to the order of work and the agencies responsible for each undertaking. These decisions can obviously be taken with greatest knowledge and judgment by an agency like the Bureau of the Budget or the Public Works Administration, or an interdepartmental committee set up for the purpose. Such an agency can enormously assist the construction bureaus by allotment of funds and projects to utilize special engineering skills and to provide continuity in the field and office work of these bureaus.

9. *Construction* by established Federal, State, or local agencies as may be appropriate can be provided through the negotiating and allotment procedure outlined above. The National Resources Board in 1934 suggested the desirability of more flexible arrangements among Federal and State agencies for pooling engineering or other special talent needed for large-scale public works.

10. *Operation* of multipurpose projects involving more than one State or Federal agency raises a series of questions treated in other reports of the National Resources Committee.[1] A variety of devices should be tried since no one method now appears generally applicable or obviously superior.

[1] Regional Factors, 1935, and Regional Planning, Pts. I, II, and III, 1936.

B. The Reorganization of Agencies to Implement This Policy involving:

1. *An advisory national resources board.*—The permanent establishment of an advisory planning board is needed for (*a*) correlation of planning within the Federal Government; (*b*) correlation of planning among Federal, State, and local jurisdiction; (*c*) stimulation and assistance to the planning agencies within the Federal Government and in regions, States, and localities; and (*d*) fundamental research directed toward the development of basic national policies and programs.

A director for planning, with an adequate staff, is recommended to keep in touch with other planning agencies and with departments and bureaus and to carry on such investigation as may be appropriate to the work of the board. A series of technical committees will be needed with representatives of Federal interests and especially qualified citizen members. The board should have authority to assist and encourage regional or interstate planning agencies, and State or local planning agencies through assignment of consultants or other assistance.

2. *A national development administration* or other suitable agency, based on the existing powers of the Public Works Administration and the Federal Employment Stabilization Office. In previous reports of this Committee,[2] recommendations have been included for a permanent agency to prepare and revise annually 6-year programs of public works, to negotiate for division of costs with Federal, State, and local governments, and to allot funds to Federal and non-Federal agencies.

3. *A fiscal advisory committee* appointed by the President. This committee would advise as to the

[2] Compare: See Report of the National Resources Board, Dec. 1, 1934, p. 5, and Report of the National Resources Committee on Regional Factors, December 1935, p. xi.

manner in which public funds shall be provided at any particular phase of the economic cycle, and correlate the timing of public works with other Federal fiscal policies.

C. Investigations and Research concerning:

1. Joint investigations of *selected river basins* by State and Federal agencies to provide bases for interstate action or permanent programs of water use and control utilizing the National Resources Committee for correlation and coordination.

2. Joint investigations of *division of fields of taxation* by Federal, State, and local interests.

PART I
REPORT OF THE NATIONAL RESOURCES COMMITTEE

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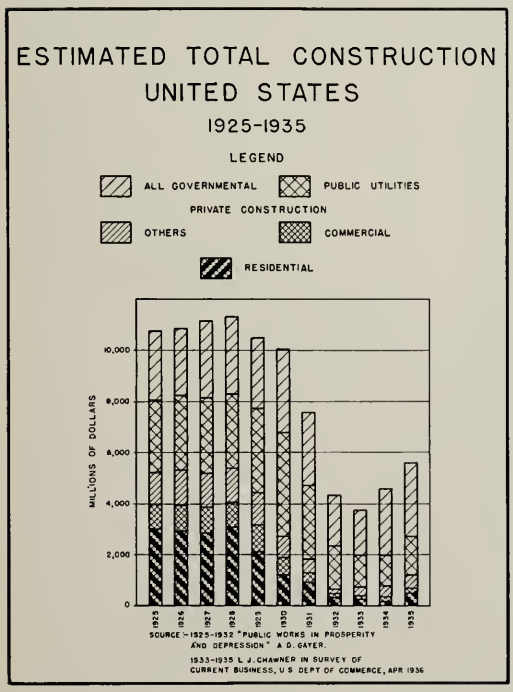
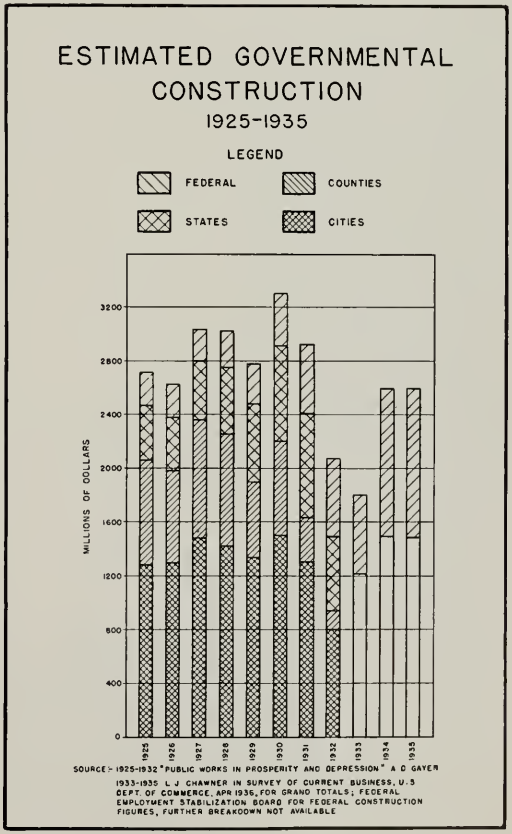
PART I—SECTION 1
THE PROBLEM—VOLUME AND TYPES OF PUBLIC WORKS

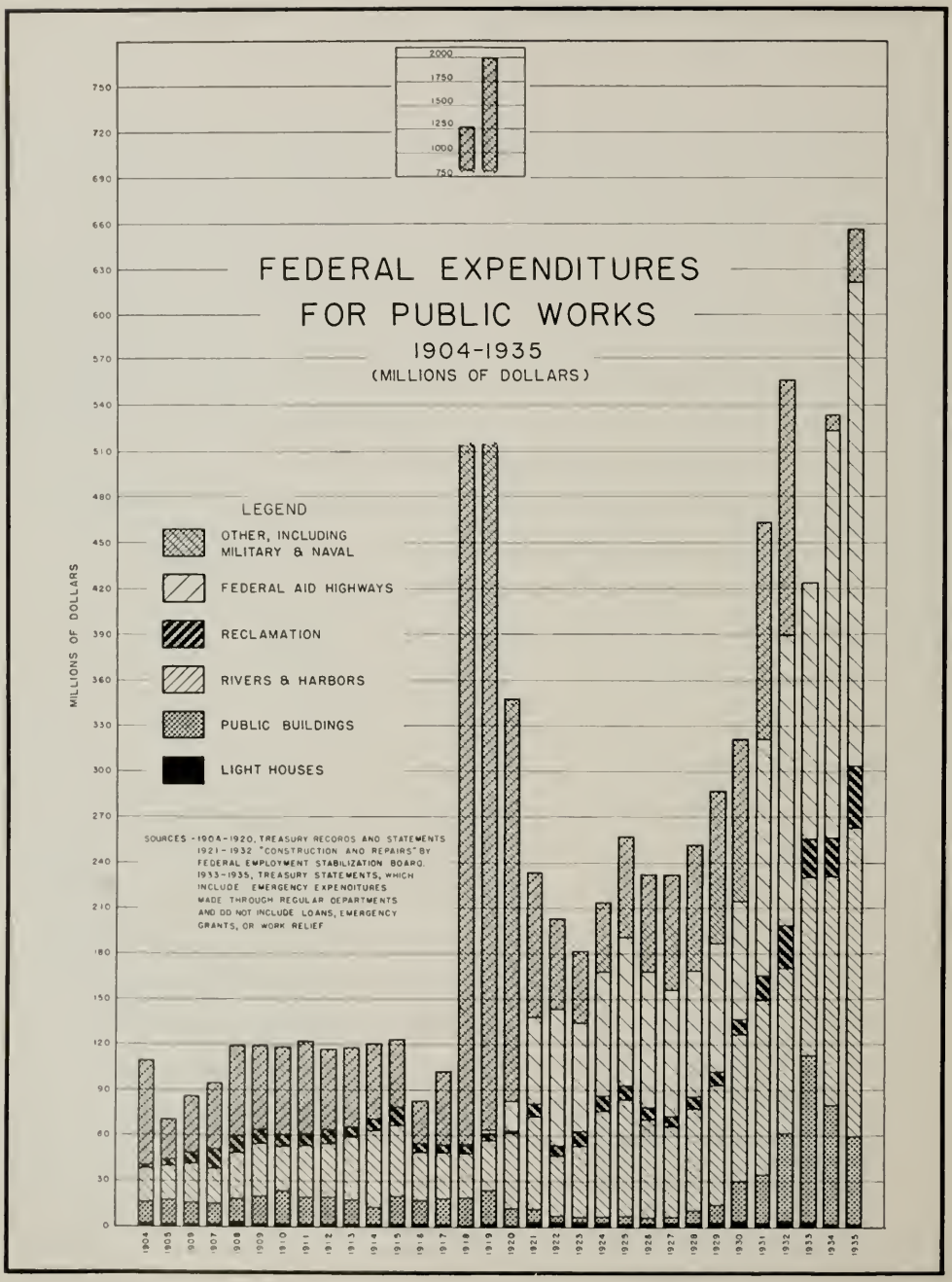
The American people are builders. The huge sums we spend on construction are evidence of a desire to further the wise development of our resources and to provide ourselves and our descendants with better facilities and improved living and working conditions. The part which the Federal Government plays in this development is usually a minor one so far as volume of work and cost is concerned, but it has been an important factor in the establishment of policies for the conservation and development of our resources—both physical and human. As a basis for Federal policy making, we should know something of the trends in the recent past and the problems to be faced before we plan ahead.

(1) *Total construction.*—Public and private construction activities accounted for upward of $10,000,000,000 of work annually before the depression, and for the employment of some 3,000,000 workers. Public utilities were spending about a quarter of this money, and private construction of housing facilities, office buildings, and other private operations accounted for over $5,000,000,000 annually. Between a quarter and a third of the total work was paid for in "normal" times by local, State, and Federal Governments.

In addition to the value of public works in supplying needs or new facilities, public construction has long been advocated as a balance wheel to lessen the violence of the fluctuations of the business cycle. The experience of the last few years, with expanded Federal construction through the regular and emergency agencies, has shown many of the possibilities in this procedure and has also shown the difficulties. In the light of that






FEDERAL EXPENDITURES
FOR PUBLIC WORKS
1904-1935
(MILLIONS OF DOLLARS)
MILLIONS OF DOLLARS
LEGEND
OTHER, INCLUDING MILITARY & NAVAL
FEDERAL AID HIGHWAYS
RECLAMATION
RIVERS & HARBORS
PUBLIC BUILDINGS
LIGHT HOUSES
SOURCES - 1904-1920, TREASURY RECORDS AND STATEMENTS
1921-1932 "CONSTRUCTION AND REPAIRS" BY FEDERAL EMPLOYMENT STABILIZATION BOARD.
1933-1935, TREASURY STATEMENTS, WHICH INCLUDE EMERGENCY EXPENDITURES MADE THROUGH REGULAR DEPARTMENTS AND DO NOT INCLUDE LOANS, EMERGENCY GRANTS, OR WORK RELIEF
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experience, what long-range policy should we now adopt?

(2) *Governmental construction.*—For many years past the total construction and repair work undertaken by local, State, and Federal agencies has been increasing, but with the depression there was a marked drop in 1931–32. Part of the great gap left by the stoppage of work under city and county jurisdiction has been filled by the expansion of the Federal program, so that today the proportion of work financed directly or indirectly by Federal funds is a major factor in the total program. How to reestablish a more normal balance among the several levels of Government handling construction work is a second problem in the organization of a future public works policy.

(3) *Federal construction.*—Public works have been a major activity of the Federal Government from the outset. Approximately 10 percent annually of the total expenditures by the Federal Government has gone into construction during the last 100 years. The growth of public-works expenditures has kept pace with national wealth and manufactures.

The story of public works undertaken by the Federal Government is, of course, as old as the Government itself. The first public work undertaken by the Congress was in 1791 through the appropriation of $23,000 for lighthouse stations and lighthouses—an activity which has continued on a modest scale to the present day.

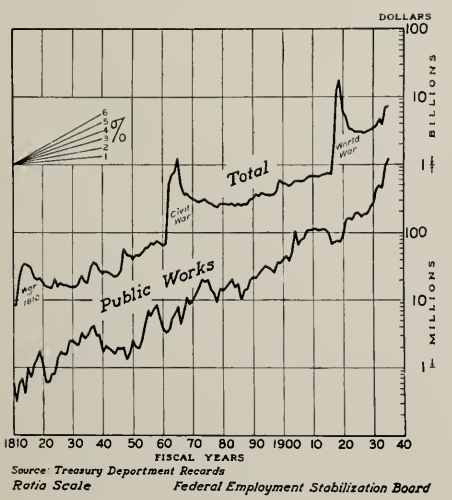
The second construction item which appears in the Federal accounts is for public buildings, starting in 1792 and growing steadily, despite occasional reductions, as in the economy years of 1922 to 1929. There has been great variation in public-works items from year to year. In the last 50 years public buildings have constituted as high as 38 percent of the total expenditures for Federal public works in 1888 and as low as 1.1 percent in 1919. In 1930 they constituted 10 percent of the total Federal works expenditure.

The third public works activity of the Federal Government to be started shows in the accounts for the year 1794, with $42,000 for construction of military and naval equipment. Naval vessels are not included in the schedules under this heading. In 1920 military expenditures constituted 75 percent of the construction program; in 1930, 20 percent. Looking back over the record for the last 50 years, 20 percent is a low average for these expenditures.

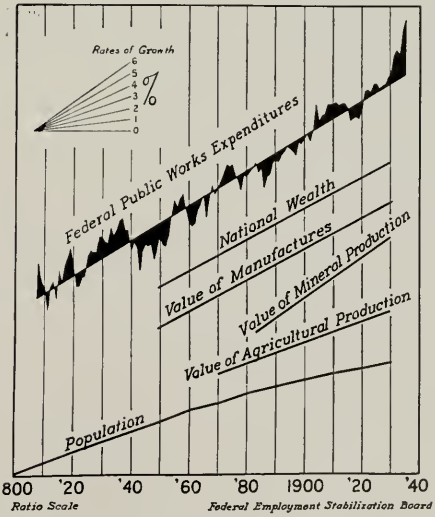
It was not until 1822 that the public-works program of the "Era of good feeling" got under way with expenditures for rivers, harbors, and flood control. These activities grew rapidly, and for many years prior to 1900 constituted more than half of the Federal expenditures for public works. In more recent years the average has run about 27 percent.

Reclamation projects are the next main category of Federal public works, beginning in 1903 and constituting in the years prior to the emergency program from 4 to 6 percent of the Federal program.

One of the youngest Federal activities in the public-works field started in 1919 with the first appropriations for Federal aid highways. This activity has grown by leaps and bounds and constituted 50 percent of the total



Federal Expenditures



Federal Public Works Expenditures With Trends of National Growth

Federal construction bill in 1922, and averaged over 40 percent during the period prior to the depression.

The proportion of the total Federal construction funds allotted to each purpose has varied from year to year so that no average percentage can adequately picture the situation and the trends. A generalized picture of the Federal public works program based on expenditures in the period from 1920 to 1930, with allowance for growth of the Federal highway program, shows:

Lighthouses (1 percent)	$2,500,000
Public buildings (8 percent)	20,000,000
Rivers and harbors (27 percent)	67,500,000
Reclamation (4 percent)	10,000,000
Federal highways (40 percent)	100,000,000
Military and naval (20 percent)	50,000,000
Total (100 percent)	250,000,000

These relative amounts varied from year to year to reflect the policy of the period.

(4) *The emergency public-works program.*—But, with the emergency program of public works begun before the close of the Hoover administration, and the work relief undertakings of the Civil Works Administration and its successors, great changes have taken place in Federal construction activities. The use of public works to "prime the pump", to provide employment for persons on relief, and an expanded and more vigorous conservation policy have all contributed to these changes.

The definition of public works has been expanded. Public work now includes the collection of basic data, mapping and preparation of plans. The term also covers a variety of services such as forestry, pest control, soil conservation, housing, and rural electrification.

This list has been still further expanded in the efforts of the Works Progress Administration to provide useful work for persons on relief in accordance with the principles established by the President.

How much of this expanded work program is to be continued is for Congress and the President to determine. Some curtailment is to be expected as the critical period of the depression is left behind. But though the activities were often instigated primarily to provide useful work for the unemployed many other services, new to the list of Federal public works since 1933 have filled so vital a need that they will undoubtedly continue. Allowance must be made in a continuing Federal public works policy for further changes in the fields to be covered by Federal expenditures for public construction.

(5) *The problem.*—Therefore, in formulating a national public works policy, the problem involves discussion and decisions on at least the following points:

1. *The planning of projects.*—Large and small, in various parts of the country—to secure a reservoir of useful projects integrated into an orderly program for development of resources and facilities.
2. *The programming of work.*—Timing the construction of planned projects in relation to need, to effect on the business cycle and to sources of labor and materials.
3. *Dividing the cost and responsibility* among the Federal, State, and local Governments and private interests concerned, and
4. *Executing the work* with efficiency and dispatch through administrative procedures of negotiation, allocation, and contract or force account.

PART I—SECTION 2
PLANNING AND SELECTION OF PROJECTS

Construction always involves planning. The carpenter who "lays out his work" is planning his job with an eye to the usefulness and appearance of the finished product as well as to the efficiency of his actions in producing it. The architect of a skyscraper or modest home, the engineer responsible for a great bridge or a dam, the sculptor before his block of marble—they are all planning. Planning for public works involves both the imagination to see the result in its true physical, social, and economic perspective, and the technical knowledge as to what is needed and how to achieve the desired result.

In this sense numerous officials in bureaus and departments at all levels of government are engaged in planning public works. They are proposing new construction, improvements, and repairs needed for their community or State, or organization. Responsive to the demands of citizens or through their own desires to anticipate such demands, the number and the field of public works are constantly expanding. The same men or their fellow workers are designing, estimating, and constructing these works.

But the very multiplicity of the projects and agencies proposing them is confusing. The proposals from different bureaus do not always fit together—they may compete or collide, or there may be an hiatus between them. A collection of projects, each in itself meritorious and well designed, does not make a comprehensive plan. Someone must take the larger view and plan on a broader scale, so that the parts can be seen in their true relationship to the whole.

1. Planning Organization

The city planning movement grew out of this need for a preview of the future development of our towns and cities. What picture or goal of efficient and satisfying living and working conditions could be created as a guide for city development? Social, economic, and administrative objectives are involved as well as physical problems. How could the activities of citizens and city officials be coordinated and concentrated on efforts toward that goal? The purpose justified experiments and trial. Today there are 1553 town, city, and county planning commissions trying to develop comprehensive plans for the future of their communities and seeking to coordinate action by private and public groups to carry out the plan.

(*a*) *State planning.*—Just as a proposal by an individual bureau cannot be judged for merit or time of construction without knowledge of how it fits in the larger plan of the whole town, city, or county, so also the value and place of the city plan must be appraised in the light of a larger picture of the State or region. Until very recent years we have had no State plans. Now there are 47 State planning boards and 35 of them are operating on a continuing basis under acts or resolutions of State legislatures. In its report on "State planning—progress and activities", the National Resources Board included a recommendation "*that the States provide for permanent establishment and adequate financial support for State planning boards where this has not already been done.*"

These State planning agencies are engaged in the preparation of "master" plans for the development of State resources. They are assisting and cooperating with local planning agencies on the one hand, and with adjoining States and the Federal Government on the other hand. Here again the "physical" plan is only one part of the planning job.

(*b*) *Regional or interstate planning.*—But again, resources and hence the projects to develop them are no respecters of political boundaries. Interstate or regional planning agencies are also needed. Here, also, the National Resources Committee has recommended[1] "*establishment, from time to time as needed, of regional planning commissions * * * as advisory bodies for planning purposes in their respective areas.*"

In different parts of the country, as in the Pacific Northwest,[2] the metropolitan area of St. Louis,[3] New England,[4] the Delaware River Valley, and the Tennessee Valley, experiments are under way for the preparations of plans covering interstate areas—harmonizing the proposals from the different States and showing the possibilities which lie ahead for regions as well as localities.

(*c*) *National planning.*—The need and method of planning for these areas are both applicable to the national field. Through the National Planning Board of the Public Works Administration, and its successors, the National Resources Board and the National Resources Committee, close relations have been developed with regional, State, and local planning agencies and

[1] See Regional Factors in National Planning, report by National Resources Committee, 1935.

[2] See Regional Planning, Pt. 1, Pacific Northwest, report of National Resources Committee, 1936.

[3] See Regional Planning, Pt. 2, St. Louis Report, report of National Resources Committee, 1936.

[4] See Regional Planning, Pt. 3, New England, report of National Resources Committee, 1936.

among the many planning arms of the Federal departments and bureaus. Again the need is for definition of goals and for coordination and understanding among the agencies both within the national Government and between them and the States in proposing and selecting projects for construction.

Within the Federal Government there are planning agencies of one kind or another for each of the departments and bureaus concerned with public works. The Corps of Engineers and the River and Harbor Board are planning navigation, flood control, and power projects. The Bureau of Reclamation and the Bureau of Agricultural Engineering are concerned with irrigation and drainage works. The Procurement Division of the Treasury and the Bureau of Public Roads plan buildings and highways. Each of these agencies and many others in the Government have specialists available and at work on the particular types of construction with which their bureaus are concerned. What is needed is *a general staff to bring together agencies working in related fields and to advise and suggest to the President and Congress plans and policies for future action.* Through its several committees and other work, the National Resources Committee and its predecessors have been temporarily performing some of these functions, pending the establishment of a permanent national planning board.[5]

A national planning board should be strictly an advisory agency with powers to carry on research and analysis of facts, to cooperate with Federal, regional, State, and local planning officials and organizations, and to submit findings and recommendations to the President and Congress.

(*d*) *Private planning agencies.*—Outside all local, State, and Federal planning activities, there are, of course, a large group of organizations and institutions interested in and supporting planning effort. Through professional societies like the American City Planning Institute and engineering groups, through organizations of officials like the American Society of Planning Officials and the related agencies in the Public Administration Clearing House, and through citizen groups like the American Planning and Civic Association, citizen support of planning has been focused on the problems now under study by the public planning agencies.

2. Making the Plans

These planning agencies and many others are engaged in making plans, for large projects and small, and for the coordination or correlation of plans into a composite whole. For every plan or project we must have facts, the cooperation of those interested, appraisal of needs, and design.

(*a*) *Basic facts.*—These must be supplied on a great variety of subjects, from many sources and by many agencies. It is ordinarily not the function of the planning agency to itself seek new facts—that is the field of organizations like the Central Statistical Board, the Geological Survey, or the Board of Surveys and Maps. However, the planning agency is often acutely aware of the lack of basic data and can stress the need to fill lacks or deficiencies.[6] Sometimes it can best prove the need through a demonstration research project. Planning is the analysis and interpretation of facts as a basis for policy.

(*b*) *Coordinated studies.*—The joint study of common problems by agencies at one level of government or at several levels is necessary to secure the understanding and participation of those responsible, specially qualified, or principally concerned. No public work can go ahead without the agreement and approval of many groups. No public work can pass the tests of usefulness, economic feasibility, and engineering excellence without the careful preparation of plans by technically qualified engineers, economists, and other specialists. Planning studies, therefore, involve coordination among technicians and specialists in different types of public works, among government agencies at all levels, and among leaders in the confidence of the public.

The experiences of the National Resources Committee in recent months with the drainage basin study, the report on the Red River of the North, and the joint investigation of the upper Rio Grande Valley (as discussed elsewhere in this volume) prove that the apparent difficulties can be overcome, and that, with forbearance, understanding, and much hard work, agreement can be reached. These studies have involved cooperation of Federal bureaus and their field representatives, State planning boards, and other State agencies. Through the consultants and advisers of the Resources Committee, continuing contacts have been made possible in the field, and the coordinating committees of the resources organization have served the same purpose in Washington.

The accompanying report on "Drainage Basin Problems and Programs" (see part II) illustrates the need for coordination of a great variety of future investigations through continuing contacts with Federal bureaus and State planning boards. The several studies proposed fall logically in the field of a number of specialized bureaus and departments, but the full value of the money proposed to be expended can be obtained only if the work is laid out to secure an interplay of

[5] See Reports of National Planning Board, 1934, National Resources Board, Dec. 1, 1934, and Progress Report of National Resources Committee, 1936.

[6] For example, see reports (*a*) National Resources Board, December 1934, on a National Mapping Program; (*b*) National Resources Committee, 1936, on Deficiencies of Hydrologic Data; (c) National Resources Committee, 1936, Interim Report of Urbanism Committee.

suggestions and proposals among the group of agencies having related interests.

The experience of the Water Resources Committee indicates the desirability of coordinating proposed studies in the water field utilizing the committee as a clearing house of information as to the various study projects under way and possibly as an alloting agency to secure the best distribution of available funds among the many investigation projects now recommended.

(*c*) *Appraisal of needs.*—Planning in a rapidly changing world cannot be all-inclusive. A first requisite to wise planning is, therefore, to find the strategic points in a working system, and without seizing more points than are necessary, to bring to the critical or significant problems the insight, inventiveness, and cooperative spirit for appropriate action. In planning public works, this means determination of the needs and opportunities for development of resources and facilities.

The answer to the question—what to plan?—appears in a variety of forms.[7] Sometimes the desires of citizens or special-interest groups are clear, sometimes the replacement of structures of recognized utility is the logical next step, or the expansion of policies previously established. No one is responsible for filling up the gaps and crevices between policies and projects. In every case the place of the project in a well conceived general or larger plan is one test of value which must not be overlooked.

There is need for—

1. Better informational service as to what proposals are under consideration in various bureaus, and for

2. An initiating and coordinating agency to check up and follow through the various aspects of such general public-works policies as may be approved by the administration or requested by the Congress. From a well-organized information service, the needed projects to fill up the gaps would soon be apparent and a suggestion to an appropriate agency would almost invariably produce cordial cooperation.

In the past there has been no lack of proposals or suggestions as to what to plan. There is no reason to suppose that the future will be less fruitful in ideas and projects. Rather, the problem lies in the wise selection of proposals which merit the time and expense to develop designs, cost estimates, and necessary data for true appraisal of value.

(*d*) *Design.*—The development of working plans for a large-scale public work is an expensive undertaking. The job is properly regarded as part of the construction cost. But enough of a design or preliminary investigation to determine economic feasibility, multiple uses involved, and legal or engineering difficulties, is a prerequisite to judgment as to whether or not the cost of more detailed plans is justified. At this stage, the engineer or planner with wide experience and reputation has a special role to play because he can appraise these problems in a broader light and with sureness of judgment. If he is a great engineer or designer as well as experienced, perhaps he can also see new combinations or ways of meeting the problem. The design stage in project planning is the test of creative genius and ability.

Every well-organized public-works department or bureau has its own designing staff or utilizes engineering consultants, or both. One of the organization problems in the public-works field is the interchange and availability of the expert knowledge in one bureau by the staff of other bureaus in the Federal, State, or local Government. Greater flexibility in the use and exchange of expert services is needed in our governmental organization.

3. Selection of Projects

The question of which projects should be included in the larger general plan is basic. We can divide the question in two parts—inclusion in the plan for placing and designing the project, and inclusion in the program or timing of construction. Here we are considering criteria of need, engineering feasibility, and economic justification.

The National Resources Board, in its December 1934 report, recommended consideration of the following criteria for selection of public works:

1. The criterion of balance, including considerations of proper proportion between expenditures, within a limited budget, for the several kinds of public works and based primarily upon balance and proportion in the several services rendered.

2. The criterion of service standards, whereby deficiencies are measured by arbitrary standards of service established at or somewhat near the peak of actual accomplishments, plus reasonable probability.

3. The criterion of essential services, applicable to such basic needs as those of water supply, sewage disposal, and fire protection, with the chief determinant simply that of whether physical conditions and degree of population concentration make these services essential to a community well-being.

4. The criterion of cost, including the following factors: Amount of total available income (dependent upon community wealth, upon public opinion, and upon public view as to what represents the real cost of public improvements); funds available for a given class of public works as determined by balance; and value to be received and benefit to be derived from a given project at a given cost, in consideration of all other needed improvements of the same class.

5. The citeria of relative need and relative benefit of individual projects in relation to and in consideration of all other needed improvements, as determinable by coordinated and comprehensive plan. These criteria are the determinants of sequence of projects.

6. The criteria of trends, and of growth and development potentialities, by which the extent and character of future requirement improvements and services may be measured. Such trends and potentialities in turn are determinable by exhaustive

[7] Cf. National Resources Board, Dec. 1, 1934, p. 54.

survey and analysis of conditions and trends, and by comprehensive long-range planning.

7. The criterion of emergency, with application varied according to whether projects involved are those for the replacement of necessary public works destroyed by fire, flood, or other catastrophe or whether these public works represent speeded-up execution of normal expansion of development of improvements and services.

8. The criterion of social and economic desirability, which for practical application must be based largely upon such arbitrary standards as may be established under item 2 above. (Many conceivable public works are quite without economic utility or social desirability, as determinable by applied common sense. The economic and social desirability of expansion of accepted and useful services is relative and in the last analysis limited only by public opinion and by limits set upon public expenditure by public opinion.)

These generalized criteria together provide a basis for planning—for the coordinated long-range plan itself is the summation of a series of just decisions. Each type of public works involves additional special problems, and individual projects must be judged in the light of special requirements over and above the general criteria listed above, although it will be noted, that this statement of criteria includes the various considerations which are ordinarily referred to as "economic feasibility", "present and future need", "timeliness", etc.

These criteria are suitable for use in relation to the median or normal program, but in the selection of projects for an expanded program in periods of depression not only these criteria but additional factors must receive consideration. An example of the type of question involved in depression periods can be taken from the experience of the Public Works Administration and the recommendations of the National Planning Board in 1933, which showed:

Planning considerations.—

Conformity with comprehensive city, regional, or State plan.— Indicate whether plan is city, regional, or State plan, whether official or unofficial, and give status of plan, date of plan, consultant, recommendation of planning board, if any, present membership and consultant to board and date of recommendation.

*Metropolitan or regional significance.—*Consider relation of project to similar or affected proposals in same metropolitan or regional district.

*Priority of projects.—*Consider comparative importance and desirability of the project to other proposals in same district which have been, or may be submitted, particularly where bonding power or other limitations are likely to limit number of projects which can be undertaken.

*Sequence.—*Consider relation of project to other dependent construction, as bridge approaches before bridges, or sewers before pavements. Is full use of project provided for which completed?

*Regenerative character.—*Consider stimulative effect of project upon other or additional construction by private or public agencies. Desirability and kind of additional work.

*Competitive character.—*Is facility provided by project in competition with existing facilities of same kind, or of same general purpose, such as railroad versus highway, public versus private waterworks, etc?

*Permanence.—*Is project a palliative or final answer to specific need? Is the utility of the facility provided measurable in terms of years?

*Continuing costs.—*Consider possible additional outlays required for maintenance and operation and who will bear such costs.

*Changes in community.—*Consider effect of direction of community growth, location of industries, population trends, etc., on continuing utility of project.

*General.—*State additional significant facts on social economic desirability of the projects. Has the proposal in its general and economic aspects your approval based on your best judgment?

These points were covered in Bulletin No. 1 of the Public Works Administration. The application forms required additional information, on the time for starting construction, the man-year costs, availability of the site, type of personnel employed on the site and in the manufacture of materials, climatic conditions, etc.

A third set of criteria relates to the availability of labor supply. The United States Employment Service, which now has offices reaching every community throughout the country, maintains a continuing register of all persons who are voluntarily seeking work, either on public or private enterprises.

In any given month, therefore, a very large proportion of the total number of persons who are unemployed and seeking work are actively registered with the Employment Service. With respect to all such registrants the Employment Service now compiles data which will indicate the number and geographic distribution of such persons, their age, sex, veteran and relief status, the industry to which they were attached, and of greatest significance, their occupational skills and fitness. A comparative study of changes in the occupational and geographic distribution of the available labor supply from time to time will offer valuable indications of occupational trends and of developing shortages and surpluses. Such data should and could be used as one of the criteria in determining the type and location of public work projects.

One advantage in advance programs of public works is that knowledge of the labor requirements of the various projects would permit the Employment Service to handle clearances of labor with the minimum of cost to the contractor and of risk to the employee, and at the same time facilitate the early initiation of the project. Knowledge of the volume of unskilled and semi-skilled labor needed for direct construction projects, as well as knowledge of the industries which will be affected by the proposed program of public works projects will permit the Employment Service to implement its present program of industrial and occupational readjustment of the rank and file workers.

Still another problem in the selection of projects for a long-range plan is the geographic distribution of allotments for construction projects. Here again

some experience has been obtained through the work of the Public Works Administration. The National Planning Board in September 1933, after review of the criteria for geographic allotments in a critical economic period, suggested consideration of:

1. Population by States or regions.
2. Unemployed by States or regions.
3. Relief funds by States or regions.
4. Families given assistance by States or regions.
5. Federal income by States or regions.
6. Area.
7. Combinations of some of the foregoing, with varying weights for different factors.

Each of these possible methods of testing distribution of funds has its own advantages and limitations, and each may contribute significant considerations to be kept in mind.

Population provides a general test by comparing percentage of funds with the percentage of population in the several States. The advantage of this method lies in its simplicity. But the needs of the States, from the social or economic point of view, may or may not be proportionate to population. Just as the aid to the unemployed provided by a project cannot be judged wholly on a basis of location, so also the need for aid cannot be judged wholly on a basis of population.

Unemployment figures would presumably show the need for aid if they were available or accurate. Even if such figures could be obtained, they would not show the whole story, for they would not include many cases of distress which are well known to exist. Self-employing rural distress cases, for instance, would not be covered by this classification.

Relief funds also are incomplete as a guide.

Families receiving aid as shown on the tables compiled by the Federal emergency relief are, perhaps, the best indication of need so far available. . . . . .

Area bears less relation to need than any of the methods just discussed, and is therefore not recommended.

Combinations, with varying weights for different factors. The Recovery Act, in section 204 (b), established a basis for allocation of highway funds, as follows:

> Seven twenty-fourths by area;
> Seven twenty-fourths by mileage of rural delivery routes; and
> Ten twenty-fourths by population.

This combination of factors is obviously not applicable to the whole program of public works, because of its special relation to post roads and omission of unemployment relief as a factor. The existence of this method as a part of the basic act does, however, suggest the advantages of a weighted factor combination as a test for distribution of projects.

The best combination appears to be an average of the population, unemployment, relief, and family figures discussed above. This average may prove useful as a measuring stick if allocations are figured 60 percent, in accordance with location of the project and remainder distributed by source of materials and similar considerations.

4. Experience and Organization for Selection of Projects

The construction activities of the Federal Government and the procedures established by Congress provide numerous examples of the possibility and desirability of review and selection of projects long in advance of expected construction.

The experience of the Corps of Engineers with river and harbor work is perhaps the best example. The first step in a river or harbor improvement is authorization by Congress for a preliminary examination and survey. In effect, this authorizes the Chief of Engineers to direct the district engineer in whose district the proposed improvement lies to make a preliminary examination and to report to him whether there appears to be sufficient merit in the proposal to justify a thorough examination.

The district engineer's report passes via the division engineer to the Board of Engineers for Rivers and Harbors (of seven engineer officers) which reviews all river and harbor improvements from an engineering viewpoint. The board report, with those of the district and divisional engineers, is passed on to the Chief of Engineers who directs a survey if found justified. If a survey is not found justified, the case is closed by the submission to Congress of the report on the preliminary examination.

The report on a survey so authorized presents a definite plan of improvement, estimates of costs and of benefits, and a favorable adverse recommendation. The report is reviewed by the division engineer, the Board of Engineers for Rivers and Harbors, and the Chief of Engineers. It is transmitted by the Secretary of War to the Congress and referred by the Speaker to the proper committee of Congress—the Committee on Rivers and Harbors in the House and the Committee on Commerce in the Senate. Upon passage of "an authorization to improve" bill through both Houses of Congress and signature by the President, the proposed improvement becomes an adopted project. The actual construction work begins on it when Congress provides the necessary funds.

Since 1914 it has been the custom to make appropriations in lump sums each year for rivers and harbors improvements which have been authorized by Congress, and the allotments from this lump-sum appropriation to the separate projects are made by the Secretary of War, upon the recommendation of the Chief of Engineers of the Army. If there are any projects in the pending authorization bill upon which work should not be carried on, the President or the Secretary of War is still in a position to order that no allotments shall be made for these projects.

A somewhat similar situation exists in the field of public buildings, where the Secretary of the Treasury and the Postmaster General are authorized by the Public Buildings Act of 1926 to report annually to Congress as to needed public buildings. They are responsible for the preparation of a "program" and money is appropriated largely on the basis of the estimates submitted by the office of the supervising architect.

The Bureau of Public Roads in its work on the Federal-aid highway system has similarly developed procedures for selection of desirable road projects so as to secure conformity of individual units of construction with the ultimate national highway system. Through the authority granted to the Bureau for negotiation and agreement with States, projects can be developed and selected a year or more in advance of proposed construction.

In the days before the Budget, Congress did all the selection of public-works projects, acting under pressure from the various bureaus and departments most concerned. The activities of the bureaus have now been funneled through the Budget so that much of the jockeying for position among Government agencies has been stopped. Congress naturally retains the basic control of the finances of the Government.

During the last few years an experiment has been tried through delegation of authority to the President to formulate and construct a "comprehensive program of public works." The success of that experiment cannot be judged adequately as yet. It seems certain that many unnecessary or unwise projects have been rejected and equally certain that not all the approved projects have been as carefully related as advance planning would have made possible. This situation is the inevitable result of the necessary speed demanded by a grave emergency, lack of previous experience in such programs, and lack of plans upon which to base the program.

The procedure which the Public Works Administration has been following has been summarized in the following terms:

All projects requested by Federal agencies pass through the Projects Division in the Public Works Administration, with the exception of those involving construction of Federal buildings, such as post offices and similar structures. The Projects Division examines all projects from the standpoint of engineering, finance, and economics. In some types of work, notably river and harbor improvements, such examinations and studies have previously been made by the Corps of Engineers. In these cases, when the project has been recommended by the Corps of Engineers, no further examination along these lines is deemed necessary.

Non-Federal projects, with the exception of transportation and housing loans, begin in the office of the State engineers (P. W. A.) and pass with its recommendations to the Projects Division at P. W. A. headquarters in Washington. They are then examined from financial, engineering, and legal points of view in the divisions bearing those titles. Transportation and housing projects do not go through the State offices, but begin at once in Washington where they are examined separately in special divisions devoted to those subjects. In case a project was rejected, review was possible by a technical board of review attached to the deputy administrator's office.

The accompanying report on drainage basin problems and programs has again shown the practical value of priority lists and selection of projects to conform with a long-range plan for development of large areas. In recent months, at the request of the National Resources Committee, the Projects Division of the P. W. A. has secured the cooperation of all construction agencies of the Government in the preparation of a 6-year program of public works. (See below, p. 19.)

From the experience of the last few years with rivers and harbors, public buildings, public roads, and the Public Works Administration, it would seem to be entirely practicable for the Congress to approve or amend a general program submitted by the President covering a number of years, and then to make annual appropriations to be applied to the construction of projects within the program in the discretion of a National Development Administration or the President.

A certain degree of flexibility in the allocation of funds to specific projects within an approved program is desirable, if not absolutely necessary. Only through such flexibility can we secure the full usefulness of the money to be spent and prevent tying up funds in incompleted projects or in excessive reserves held for undertakings the cost of which was overestimated. By leaving some discretion to the executive branch in the handling of specific construction jobs, the work of various construction agencies can be more effectively integrated and continuity of staff maintained. If Congress absolutely controls the program, it would be reasonable to place on the administration responsibility for the effective use of the money within the approved program. This method of procedure would also not encroach in any way upon the prerogatives of the Budget Bureau, but would provide the possibility of speeding up public works in time of depression because of the availability of planned projects awaiting only funds to begin actual construction.

These examples illustrate the fact that in several fields the responsibility of the executive for the presentation of a program of public works is already recognized. The apparent need now is to expand the type of projects included in the program so as to cover all of the major fields of Government construction. A central public-works authority or National Development Administration might be made responsible for the preparation of such a program or reservoir of projects for submission to the President, just as the Director of the Budget is responsible for presenting a fiscal program for his action, and for transmittal to Congress.

PART I—SECTION 3
PROGRAMMING THE WORK

1. State and Local Inventories and Programs

Experience in cities and States throughout the country, especially emphasized during the recovery program, has shown that advance planning and programming of State and local public works produces better improvements for less money.

Financial advantages.—The responsible authorities in any city or State can plan and budget the year's expenditures for capital improvements to better advantage if they have a clear picture of the probable requirements for similar items over a period of 5 or 6 years. They need this information in relation to their budgeting for debt services, for current expenses, and for possible revenues. With a reservoir of planned projects to draw upon, the order of work can be adjusted from time to time. Sometimes projects can be deferred without disadvantage until material prices, land prices, etc., are more favorable, thereby effecting considerable savings of public funds. Other projects can be pushed ahead when favorable opportunities present themselves.

A further advantage in advance planning and budgeting of construction needs lies in the hope that, by wise handling of the city's finances, the ordinary and inescapable needs for construction may eventually be met out of current revenues. The city of Milwaukee, Wis., is working toward this goal, and its city planning board reports that this is one of the chief purposes of its programming.

Better projects.—That advance planning and programming of local improvements results in a better selection of projects and consequent improvement in public facilities is also amply attested by experience. Planning, even for 1 year, should result in projects which in themselves are properly designed to fit their respective needs. Planning projected into future years yields the additional benefit of planned sequence of projects, arranged in order of their need and according to the community's ability to finance them.

Relations with other governments.—Advance programming also facilitates mutually advantageous arrangements among neighboring or overlapping governmental units. Just as planning is needed as the basis of cooperative compacts or agreements among States in broad development projects, so there are many instances where intercity or city-and-county plans projected into long-time programs will point the way to advantageous cooperation among local governments, both in financing and in operation.

Local public works programs, covering a period of years, may be of great value in the development of State financial policies and particularly in relation to legislation concerning the debt limits of municipalities. The experience of the Public Works Administration in the analysis of non-Federal projects has repeatedly shown the need and value of a long-term plan.

Timing for economic stabilization.—Much has been said and written about the timing of public works, not only for purposes of local economy as suggested above, but as a means of providing employment in times of business depression. Since State and local public construction normally amounts to about four-fifths of the annual expenditure for public works, the effect of properly timing local activities is relatively very important. The increasing practice of planning and building up a reservoir of local construction projects is probably due in no small measure to the situation created by the lack of well-considered projects at the beginning of the present work relief program. Today, with the help of the Public Works Administration and the Works Progress Administration and of staffs supplied to State and local planning boards by the Works Progress Administration, much progress in advance planning of needed improvements is being made, and many localities are now provided with good priority lists of needed projects, accompanied by drawings and specifications. If these plans and programs are revised annually and kept up to date, these communities will be armed in another crisis against the pressure groups interested in particular ill-assorted or unplanned projects.

Programs and budgets.—The relationship between a long-range program of public works and a long-range budget has often been misunderstood. Both are needed if public works are to be utilized to reduce the violence of the business cycle. The long-range capital budget has been utilized, in fact, whenever cities and States have borrowed to finance permanent improvements—the capital budget extends over the whole period until the bonds are paid off or the improvement wears out. We have been so concerned to establish budgetary procedure balancing the budget of a single year, that we have sometimes overlooked the significance of our long-range plans and made a fetish of the annual budget as contrasted with a 4-, 5-, 6-, or 10-year budget.

Legislation requiring budgets for local units of government has been passed in varying forms by 33 States, and administrative supervision by the State is pro-

vided in 21 States. But few of these laws, however, apply to capital improvement budgets. The next step is to secure the development of these capital improvement budgets to accompany and carry out the programs of needed public works.

General consideration.—No statement of the value of advance programming would be complete without mention of another, less tangible but quite important, benefit which this sort of public business practice returns to the community. The existence of a long-range public improvement plan, with projects arranged in order of need and suitability, means that the local officials dealing with finance are equipped with tools necessary to satisfactory performance; and that the personnel in the engineering, designing, and construction departments will be enabled to work economically and effectively.

The existence and public knowledge of a plan serves to arouse and assist in maintaining civic interest in the community's development. A publicized priority list will act both to stimulate citizen cooperation toward a progressively improved program and to relieve local officials of the sole responsibility for dealing with importunate groups interested in expenditures for particular purposes.

Experience in Programming

In a number of instances prior to 1931, State and local governments had developed long-term bond or financial programs of capital improvements projected from 5 to 10 years into the future. Most of these programs grew out of efforts to justify special projects or bond issues, and few, if any, of them made provision for annual revision or extension to insure continuity of advanced study of public improvement needs. One of the few exceptions is the procedure followed by the city of Cincinnati, Hamilton County, and the local school board which jointly operate under a long-term financial program for capital improvements covering a period of 5 years in advance. The Cincinnati program is annually reconsidered, revised, and extended 1 year, thereby insuring always a 5-year program.

One of the earliest long-time programs for any local governmental unit was that of the Minneapolis Board of Education, which in 1916 provided for the financing of permanent improvements and extensions of the school plant to meet the educational needs anticipated during the succeeding 5 years. One of the earliest city-wide programs for general public improvements to be adopted at the polls was that of St. Louis voted in the election of 1923. This program included 21 separate projects at a total estimated cost of $88,372,500, and was financed by bonds and appropriations to be made during the ensuing 10 to 15 years. The program covered all departments of the city government except schools and transportation. Likewise, the city of San Francisco, faced with the need for extensive costly improvements with limited financial resources, formulated a 10-year development program in 1924, which, however, owing to governmental reorganization, was not carried beyond the stage of public hearings. An interesting feature, however, of this program was the proposed classification of projects under the following four headings for the establishment of priorities: (1) Immediate necessities; (2) other necessities to be included in the 10-year program; (3) desirable projects to be taken up after completion of those in first two groups; (4) projects incompletely formulated or not approved.

Long-time bond or financial programs for public improvements have been prepared for other cities, including Detroit, Mich.; Kansas City, Mo.; Newark, N. J.; Kalamazoo, Mich.; Toledo and Dayton, Ohio; Buffalo, White Plains, and Rye, N. Y.; Los Angeles, Calif.; Boston, Mass.; Dallas, Tex.; Des Moines, Iowa; Richmond and Roanoke, Va. While some of these were officially adopted, very few, if any, contained any provision for annual revision and extension. Long-term county bond programs have been recommended for Wayne County, Mich.; Los Angeles County, Calif.; and Mercer County, N. J.

In connection with a survey of city planning recently undertaken by the research committee on urbanism, 102 cities throughout the country returned reports which, among other information, indicated the extent to which advance programming of public improvements is now practiced. From a summary of these reports, it appears that 22 cities have adopted a policy of advance programming, although in 13 instances the policy is stated to be unofficial. The periods for which the programs are projected vary from 5 to 50 years. Continuous or annual revision is practiced in five cities.

While in many instances State departments have planned and budgeted their individual construction programs, there is little record to show that State governments have been interested in the advance planning and programming of their total construction requirements.

Generally speaking, the interest which State governments exhibited prior to the inauguration of the State planning movement, dates from the relief and employment problems of the depression. In some States, through various official and unofficial reports, recommendations were made in 1930–31 similar to those advocated by the Federal Employment Stabilization Board.

In Massachusetts a special committee on stabilization of employment made a study of public and private employment facilities and of the use of public works construction as a stabilizing influence. The report made to the Commonwealth in 1931 summarized the essentials of a public works control plan and recom-

mended an act to establish a State public works planning board. The suggested bill provided that the proposed board should examine the construction plans of all State departments, and should annually formulate from these a State construction program for the ensuing 5-year period. It also provided for the annual submission to the board of forecasts of county construction prepared by county commissioners.

Various State departments in California have programmed their individual future construction requirements. Such programs have been in operation for 5- to 10-year periods in respect to roads, conservation, park development, and construction of State institutions. The California State Unemployment Commission recommended in 1932 that this practice be expanded to include all State and local governments. The Commission proposed the appointment of a public works planning board, with authority to prepare a 10-year construction program for all State public works, including the tentative assignment of each project to a given year. It also recommended that this board should have power to administer the program so as to restrain construction during years when business and employment are active, and to accelerate it in periods of depression. The program was to be revised every 2 years, and extended 2 years into the future. These recommendations were embodied in a bill which was introduced into the State legislature.

In 1931 the Pennsylvania Committee on Unemployment in its report to the Governor recommended that "a long-range planning board for public works should be set up * * * which will prepare a 6-year plan of projected public construction by the State and the local bodies. This plan should be revised every biennium and thus always projected 6 years into the future; it should list the specific pieces of work to be undertaken, the time schedule to be followed for the same, and should hold a considerable proportion in reserve to be launched during periods of depression." The committee also recommended that plans for projects to be launched in depression periods should be drawn very far in advance, and that in many cases bond issues should be authorized. These proposals were presented to the legislature in 1933 in two separate bills, and again in the extra session of 1933, but did not become law.

The Wisconsin Legislative Interim Committee on Unemployment in 1931 recommended the long-time programming of public works by the State, and a reserve fund for use in times of emergency. A New Jersey commission to investigate municipal taxation reported in the same year the advisability of advance programming of State and local construction. Similar proposals were made to the legislatures of New York, Washington, and Minnesota.

Stabilization Board.—Upon the formation of the Federal Employment Stabilization Board, the Federal Government turned its attention to planning and coordinating the construction activities of all Federal agencies with the thought that, through proper planning and timing, this Federal construction might be utilized as a "balance wheel" for the stabilization of employment. One of its duties was to assist local and State governments in the establishment of long-range public-works programs. A special demonstration was made of the 6-year programming of public works by the municipal departments of the District of Columbia for the years 1933–39, since the District Government came within the terms of the Employment Stabilization Act as a Federal agency. This act definitely provides for annual revision of the program and extension for 1 year. Under the provisions of the act, all District of Columbia agencies expending funds for construction or repair of public improvements were required to program such expenditures 6 years in advance, specifically designating expenditures to be made in each of the 6 years on the basis of their order of priority.

Public Works Administration.—As soon as the Federal Emergency Administration of Public Works was organized and began operation, it was flooded with requests from State and local governments for assistance in financing their construction. Many sound projects were proposed. Many other projects submitted proved to be impossible or impractical proposals. Because of the depression, the engineering and designing departments of States, cities, and counties had been so reduced that detailed plans and specifications were not available by which to judge the projects upon their individual merits. Perhaps even more serious was the fact that the preparation of broad and balanced plans for community development had also been for several years practically suspended, so that the individual projects, even when apparently sound in themselves, could not be judged in their relations to other projects.

State planning boards.—The National Planning Board, established in 1933 as a part of the Public Works Administration, offered assistance to States in setting up State planning boards. It proposed to furnish technical advisors or consultants, to be nominated by the newly formed State planning boards, and compensated by the National Board after approval of the nominations. Needless to say, an immediate function of the newly organized State planning agencies was to consider the whole matter of public construction. The boards originally set up by Governors' appointment have rapidly been replaced by permanent statutory boards, so that at the present time there are 46 State planning boards in operation, of which 33 are set up by State law or resolution. The program in each State has

from the first been developed entirely under the direction of the State officials and citizens comprising the boards. Always the national planning agency has stressed the importance of properly planning and programming public construction by the State planning board for State departments, and by local planning agencies for city, town, and county construction. It has stressed, also, the advantages which accrue from cooperation between local and State planning agencies.

The 1935 public-works inventory.—In the latter part of 1934 the State planning boards were requested by the National Resources Board (successor to the National Planning Board) to aid in securing a quick summary or inventory of public construction projects. Procedure was set up by which it was hoped that project applications could be considered and reviewed in the State, so that the flood of miscellaneous applications, partly well-planned projects and partly the expression of not too well-considered ideas for local improvement at Federal expense, might be converted into organized inventories of projects needed for community development. These summaries, by States and one for the Nation, would then form a possible basis for the Nation-wide program of construction under the recovery drive. For this inventory the State planning boards had the cooperation of the Public Works State engineers and the Federal Emergency Relief Administration, which furnished staffs to the various State boards in amounts necessary to supplement State appropriations and personnel loans for planning.

For the conduct of the inventory, all agencies of State and local governments concerned with construction were supplied by the Public Works Administration with a general questionnaire asking for information regarding the reporting unit, such as population, dominant character, industries, transportation, and utilities. Accompanying this questionnaire were two schedules for listing and describing projects selected for inclusion in the national inventory. A weekly progress report was sent to Washington, where current lists of projects were made available for official use before the final tabulation was made.

The results of this first inventory of public construction projects were made available in March 1935. The inventory provided a valuable record of useful and desirable State and local works projects, the data concerning which have now been tabulated for immediate official use and future reference. A wide variety of projects was submitted in the inventory totaling some 135 different types. By the grouping of types into general classes it is found that, on the basis of estimated costs, approximately 22 percent are streets and highways, 14.5 percent reclamation, flood control, waterpower development, 11.5 percent water supply and sanitation projects, 9 percent buildings other than schools such as public buildings, housing, terminals, and markets, 8 percent heavy engineering structures such as bridges, tunnels, wharves, and transit improvements, 7.7 percent transportation, 6.6 percent schools, 5 percent grade crossing eliminations, 4 percent various utilities, 3.2 percent recreation, 8.5 percent miscellaneous projects such as aviation, water navigation aids, pest and disease control, fire protection, mapping surveys, and planning projects.

Inventory returns were received from 21,200 reporting units of which 3.4 percent were State, 14 percent county, 42 percent municipal, 38.8 percent township and special district, and 1.8 percent miscellaneous. There were listed 137,400 State and local projects estimated to cost approximately $20,366,500,000. Of the total estimated cost only 5 percent or $1,066,000,000 represented the amount included for necessary purchases of land for projects. It may be noted that the total of more than twenty billion dollars is approximately the estimated total of capital outlay for public works for the 8-year period of 1935 to 1942 based on extension into the future of the average annual capital outlay for the entire United States (national, State, and municipal) of about $2,400,000,000 for the 10 years 1921 to 1930.

Analysis of the comments of the reporting units, the State planning boards, consultants, and P. W. A. State engineers revealed that, based on total estimated cost, 62 percent of the projects were reported as needed. About 27 percent of these, representing 17 percent of the total cost of projects in the inventory, were considered to be revenue producing.

Many of the State planning boards, in collaboration with the P. W. A. State engineers and State relief directors in some cases, have augmented and further analyzed the data produced by this inventory, the results of which they have incorporated into significant reports.

A variety of means were used by the different State planning boards to secure accurate reports and complete coverage. In Iowa the survey included interviews not alone with responsible officials but with representative citizens as well. In Kansas projects submitted by local agencies were revised by technicians on the planning board staff or attached to State departments, and were then returned for review to the reporting agencies. In Tennessee the engineers and architects of the State, and all civic clubs, were requested to assist in securing a full inventory from their communities.

In Michigan the State was divided into nine districts or regions, within each of which available projects were inventoried and classified in the light of geographic and social characteristics of the region. The completed long-term program for the State comprises some 12,000 projects, to cost a total of nearly a billion and a half

dollars. The State program includes highways, conservation projects, State buildings, aeronautic development, State educational institutions, and items of other State agencies empowered to construct or to function in relation to public works. The report of the Michigan State Planning Commission says of these department programs that they "are not conceived hurriedly to meet in any way the exigencies of this inventory. They are well thought out. They are the result of longer time views than merely emergency considerations of this State's needs." The district programs include primarily items of water supply, sewage treatment, industrial wastes, flood control, and drainage. Projects submitted by local units of government were reviewed by the commission in the light of regional conditions and programs.

The New York State Planning Board reported a total of 3,719 projects, of which 802 were submitted by State departments, 77 by New York City, and 10 by the Port of New York Authority. The total cost of these projects is estimated at just under 2½ billion dollars. The New York City projects amount to approximately one-half of the total. Projects were reported by 333 governmental units and agencies out of a total of 519 queries. The official report of the inventory by the New York State Planning Board states that it "has given the State planning board a tremendous amount of material in regard to available projects many of which are vitally related to any general plan for the future physical development of the State. It has also brought forcibly to the attention of municipal and county officials the advantages of city and regional planning in developing their own programs for public works."

A number of the State reports prepared in connection with the inventory include a tentatively proposed long-range public works program while others confine their initial approach to setting up general groups of projects which should be undertaken or present a statement of principles or criteria to guide the formulation of a specific program. All the reports, however, bring together and relate information, recommendations and the results of studies which have been made by various agencies in the past as well as the present. By so doing they have made a valuable contribution to the body of data essential to the intelligent appraisal, selection, and programming of public works projects by Federal and State agencies.

It was not expected that such a hastily organized review and consideration of project applications would result in a final and entirely acceptable program of public construction for each community. In many instances, of course, the preparation of the inventory resulted in construction of the projects as set up therein, sometimes by the Public Works Administration and sometimes by the Federal Emergency Relief Administration, or the Works Progress Administration. But whether or not the inventory resulted in any community in immediate construction, a distinct benefit was realized in practically every instance by directing the attention of local officials to the need for comprehensive and well-balanced plans and programs for community development.

1936 six-year programs.—Encouraged by the results of this first Nation-wide inventory, the National Resources Committee, in July 1936, suggested to all State planning boards the annual revision of the inventory of local and State construction. Initiative in this was left entirely to the State boards, attention merely being called to the desirability of continuing the public works programming effort.

To assist such boards as wished to undertake the new inventory, the National Resources Committee, in cooperation with the Public Works Administration, the Works Progress Administration, and other Federal agencies, prepared a "Suggested Procedure for Public Works Programming" which was offered to all States as a possible basis for action.

While it was pointed out that early returns from State-wide programs or inventories might be helpful to the Federal Government in considering national needs in relation to the work relief program, no definite date was suggested for reporting, and the State boards were in no way urged to undertake the job from the standpoint of fitting in with a Federal program. Emphasis was placed rather upon the need of continuing and expanding the practice of advance planning and budgeting by local governmental agencies.

The method of securing data was left wholly for the individual State planning boards to determine, and as a result a variety of techniques have been developed. The relative success of these different methods will be analyzed when the returns are complete, with a view to suggesting for future use those which seem to be best adapted for the preparation of long-term programs of non-Federal public works. Special public works committees, often representing such outside interests as the State League of Municipalities and the State University, have generally been appointed by the boards to handle the inventory, but the details of the procedure have, of course, been largely dependent upon the funds and technical assistance available.

In most cases, project reporting forms were sent out by State planning boards with covering letters to heads of State departments, and to officials of local government throughout the State. In Florida, the only State in which every county has an organized planning council, the project reports are being gathered largely by these councils, with unusual success, it now appears.

In New York State, the Division of State Planning has made use of its weekly news letter service, which reaches about 200 newspapers throughout the State, to explain the aims of the inventory and the procedure involved. All regional, county, and local planning boards in the State were asked to assist local officials in preparing project reports.

The North Dakota State Planning Board arranged a series of meetings in the various counties of the State at which local officials were able to learn at first hand the purpose of the program and the method of conducting it. These meetings were conducted by members of the planning board staff in cooperation with representatives of Federal construction agencies. A similar series of meetings reaching all the counties of the State was conducted by the Indiana State Planning Board.

The Public Works Committee of the Oklahoma State Planning Board assembled a staff of six competent field workers who made personal contact with every county board, county school superintendent, and independent school district in the State, and visited every city of more than 400 population. Approximately 1,000 of these field contacts were made. Each field representative took with him copies of the 1935 public works inventory for his district; he had also been furnished with an analysis of the sewer and water conditions in each community he was to visit, together with a list of possible projects which might suggest needed public improvements to the various officials. The State planning board also prepared and mailed in advance to each community, a list of the projects submitted by that community in the 1935 inventory, with a letter requesting that officials review the list and make any corrections or additions they deemed desirable.

The Colorado State Planning Commission, because of limited personnel available for field work, covered only selected areas of the State. Forms were sent out to officials in only one area at a time, after which field representatives visited that area to assist officials in filling out the forms.

The Michigan State Planning Board, which prepared an exceptionally thorough long-term public-works program in 1935, is bringing the earlier inventory up to date, and assigning priorities for 1937.

In all the States, the reporting officers have been asked by the State planning boards to list their projects numerically in the order in which it is hoped they will be constructed, and to rate them approximately for permanent social need, financial advisability, and employment potentialities. The sum of these ratings stands as the total rating of the project from the point of view of its sponsor.

A logical development of the current program, sponsored and encouraged in 43 States by the State planning boards, should be the rapid adoption of advance programming procedures by local governments throughout the country. With the continuing support of the State planning boards, the present inventory should be successfully completed and a basis should be laid in each community which will enable it to carry on its own local programming as a continuous process. Further experience will undoubtedly develop better techniques and performance which will be of value not only to local governments but to the States. In addition to the benefits to the communities themselves, the State planning boards should profit by the present inventory in many direct and indirect ways.

Public works programming has hitherto lagged in local communities because the relation of local construction to the more extensive programs of State and Federal Governments has not been made sufficiently clear. The emergency public works activities of the Federal Government, however, have served to demonstrate the functional unity of all public construction at whatever level it may take place, and to emphasize that it is the local community that has most to gain from long-range programming of public works.

It is definitely to the advantage of town and city to know in advance what construction of county roads and State and Federal highways will be undertaken in any ensuing 6-year period, to know what river and harbor development will be begun, what State and Federal public buildings are contemplated for construction. And it is as surely to the advantage of the local community to plan its own construction activities to fit into the pattern of proposed work by other governmental units. Only by making its own intentions as to schools, streets, and public utilities known can these be fully integrated with the plans of other and overlapping jurisdictions.

There must thus be not only careful planning of public construction by each governmental unit, but also coordination of all these plans to prevent duplication and waste, and to promote orderly and unified development. The public works inventory serves this purpose, and through their work in coordinating State and local programs, the State planning boards have shown themselves to be the potential instruments for carrying out a permanent policy of public works planning. The planning boards are in position to serve as public works councils, stimulating interest in programming construction on the part of local governments, supplying advice and technical skill, and integrating from the larger point of view of the State as a whole the various programs prepared by counties, townships, and municipalities.

The State planning boards have contributed to the success of the inventories and their participation has strengthened the position of the boards for the future

planning and correlation of public works. In many cases the projects reported are stated in most general terms, and, before they can be adequately evaluated, more information is needed as to the long-range plans which may lie behind immediate proposals. The inventories have placed the boards in position to seek out the background material, and have justified them in requesting further information from reporting authorities in order to make the best use of the material already secured. In brief, the inventories have served to assist State planning boards in their coordinating functions among State and local authorities, particularly in bringing out long-range programs not previously available from cooperating agencies.

2. Federal Efforts and Experience

Procedure for approval of river and harbor projects developed over a period of years had shown the practical possibility of a reservoir of approved projects when the act to establish a Federal employment stabilization board was passed in 1931. That act made it compulsory for all construction agencies of the Federal Government to develop a reservoir of projects and added that proposals should be arranged in order of proposed work for a period of 6 years in advance. The time element and the budget idea were thus added to the problem of wise selection and programming of projects.

The Federal Employment Stabilization Act set up a board composed of four Cabinet Members whose duty it was "to advise the President from time to time of the trend of employment and business activity and of the existence or approach of periods of business depression and unemployment in the United States or in any substantial portion thereof; to cooperate with the construction agencies in formulating methods of advance planning; to make progress reports and to perform the other functions assigned to it." It was required to take into consideration indexes of employment, and the act authorized emergency appropriations upon the request of the President to combat unemployment in periods of depression. Congress declared it to be its policy to have available a "6-year advance plan, with estimates, showing the projects allotted to each year."

A beginning has thus been made toward the formulation of a balanced program of Federal public works. The budget procedure provides one kind of program, and the reservoir of projects, prepared in accordance with the Stablization Act, has stimulated the bureaus and construction agencies to think in terms of years instead of for the single year ahead.

The 6-year program prepared by the stabilization board proved enormously valuable in the quick development of Federal projects at the outset of the work of the Public Works Administration, but the organization of the board in the midst of the depression period has prevented the full use and development of its possibilities. The board was abolished and its functions were transferred by Executive order to the Department of Commerce in March 1934. With the inauguration of a special study for the National Resources Committee on a possible future 6-year program in 1936, the records of the board have been transferred to the projects division of the Public Works Administration.

On the authority of the President, the projects division of the Public Works Administration, acting for the National Resources Committee, requested the Federal agencies concerned with construction and repair operations to revise their 6-year programs in June 1936, so that, in effect, the work of the stabilization board has been continued. In response to this request 71 bureaus and independent offices submitted programs which include nearly 10,000 items, totaling $5,040,000,000 for the 6-year period.

The following table shows the total estimated expenditures for this reservoir of projects for each fiscal year:

First year	$1,058,568,650
Second year	891,762,972
Third year	809 801,895
Fourth year	760,410,881
Fifth year	737,084,401
Sixth year	753,733,438
Total	5,011,362,237

An analysis of these funds by type of work shows the following distribution:

	Percent
Streets and highways	25
Irrigation, drainage, and flood control	24
Buildings and equipment	17
Soil conservation	8
Forest conservation and development, game protection, and pest control	6
Grade-crossing elimination	6
Water navigation aids	6
Total	92

The remaining 8 percent is distributed among recreational projects, vessels, aviation aids, and facilities, slum clearance, and low-cost housing projects, water and sewer projects, and similar items.

For each project, listed by the various bureaus, information is recorded in the program covering location, type of work, estimated total cost, authority from Congress, previous funds allotted, proposed expenditure for each fiscal year, status of plans, and status of land or site, as well as data on number of men to be employed on the site, total man-hours, estimated man-year cost, and how soon work at the site may be begun.

Each bureau recommended an order of priority in importance as well as in time for each project so that the program in any one year could be expanded or contracted by reference to these priorities. Flexibility of the program is limited in some respects, however, by the authority granted by Congress for obligation of funds in future years to cover completion of construction contracts or in relation to State cooperation as in the case of the highway program.

The limited time available between approval by the President in June of the procedure to make the 6-year program and the date fixed for delivery, December 1, 1936, has precluded discussion of the details of the program with each reporting agency and the development from such discussions of priorities as between projects and bureaus. The date of delivery also affects the usefulness of the program to the Director of the Budget in formulating the Budget for the next fiscal year. The program, as submitted, however, is a partial and incomplete example of the kind of reservoir of projects and statement of priorities which the committee recommends for annual revision and extension.

In future years the full usefulness of a 6-year program can be obtained if the National Development Administration or other public works agency secures the recommendations of the Federal bureaus for their future work by May 1, permitting time for the analyses and discussion of projects and interrelation of priorities among the several bureaus before the Director of the Budget formulates the budget recommendations for the succeeding fiscal year. Both the powers of the Federal Employment Stablization Act and the procedures for cooperation between the Bureau of the Budget and the agency preparing the 6-year program as described in that act are adequate to provide for the successful development and annual revision of a 6-year program if these powers are conferred on a permanent national development administration as now recommended.

3. Theory and Practice of a 6-Year Plan

If public works are to be utilized to mitigate the violence of business cycles, it is obvious that projects must be ready for construction, authority to proceed must be promptly forthcoming, and cash must be available to pay for the work.

If projects are to be ready for immediate construction whenever the word is given to "go", a great deal of preparatory work is necessary. Land must be acquired, authority provided or legal agreements reached, plans and specifications made ready and currently revised—these and other similar steps can often be taken long ahead of actual construction. Appropriations and staff organization can be arranged most efficiently for such work in the light of a program over a term of years. A part of the preparatory work may perhaps prove useless since, with the passage of time, new needs or new ways of doing things may take old plans obsolete, but in many other cases purchase of lands or efforts to obviate legal tangles will prove advantageous and economical when undertaken years before expected development. In brief, it is safer to err on the side of preparedness.

We do not hesitate to provide large sums during peacetimes for the preparation of plans, and even building of battleships or forts, to meet a war emergency. It would be logical to spend a fraction of those sums for drafting plans and specifications, purchase of needed lands, legal arrangements, and other preparations in times of prosperity to have projects ready for construction in another economic emergency.

Not only plans but authority must be provided in advance. The Congress has adopted a policy of authorizing projects or lines of action before making appropriations to carry them out. In the case of river and harbor works, projects are approved and authorized specifically long in advance of intended construction. For public roads and large-scale operations extending over a period of years, authority has also been granted to obligate the Government to contracts and agreements anticipating future appropriations. There is ample precedent for advance authority to cover a major program of public works.

The 6-year plan started in 1931 also implied another theory in relation to the budget. Construction agencies, preparing the long-range plan, were led to think of budget requirements in terms of years instead of an annual budget. Part of the preparation for an expanded construction program is, therefore, the wide acceptance of the theory of the long-term budget and public willingness to provide the authority and cash to make it work.

To have available a reservoir of projects, it should be the function of a permanent public-works agency or national development administration to prepare 6-year programs for action by the President and transmittal to Congress. As in the case of the budget in relation to financial affairs, it is or should be a responsibility upon the Executive to present to the legislative branch a balanced construction program. Balance must be maintained among types of projects, among construction agencies, in the location of projects among the States, people, needs, etc. Programming involves the time element—the long-range timing of public works in relation to business cycles and a sequential relationship among the projects themselves. The Congress and State legislatures changed the budgets submitted to them, and would doubtless change the program from time to time, but the existence of a carefully organized plan should assist the Congress as much as the executive departments.

PART I—SECTION 4
TIMING AND DIVISION OF COSTS

In the previous section and in part II of this report the National Resources Committee presents a long-time program of public works, including a detailed study of 120 drainage basins and a wide range of other public works developed largely with the assistance of the Public Works Administration and the State planning boards.

The present section deals with a plan for the better administration of long-time public-works programs. This includes:

1. A national development administration or public-works agency (discussed on pp. IX, 12, and 20).
2. A panel of appraisers to allocate costs.
3. A fiscal advisory committee.

The fundamental reason for attempting to divide the cost of public works is that they may not equally benefit the citizens of the governments concerned in joint undertakings. The attempt to divide costs is thus an effort to do justice to the citizens or economic groups inhabiting the territories served by particular governments. When costs are being apportioned among the various units of government, what is being done is fixing the tax burden of particular taxpayers or groups of taxpayers. In last analysis, costs are not being divided among governmental units but among citizens and taxpayers in given areas. The problem is thus one of the justice of the incidence of taxes paid, in relation to the incidence of benefits received from governmental activity. Absolute justice would require consideration of all the effects of taxation and expenditure on individual welfare, necessitating in the case of division of costs of public works the appraisal of net personal advantages, a task so difficult that it would break down in execution, even if suitable techniques were assumed to be available for measurement. As a practical matter, therefore, costs must usually be divided among particular governmental units unless benefits are so unequal as to warrant the creation of special areas within which costs can be more fairly distributed, or the recoupment of costs for greatly unequal advantages reaped by the specially advantaged individuals. Yet the fundamental fact that any division of cost is an assignment of the burden among individual taxpayers cannot be lost sight of.

In the past in divisions of the cost of public works among particular governments, the relative incidence of taxation and the effects of expenditure have had little weight. The sharing of costs of public works and other activities has been accomplished mainly through the extension of grants-in-aid, recently supplemented by loans to subordinate governments. While the result of the grant-in-aid policy has been to effect a sharing in the cost of various enterprises, the divisions themselves have often been of incidental importance. The National Government has been interested, for example, in the stimulation of certain activities such as roads or perhaps in the equalization of conditions and advantages. Under the circumstances, refined methods of dividing costs have not been attempted. The formulas for sharing costs have been influenced by considerations of political expediency, by the formulation of arbitrary rules of thumb as to apportionment, and by adherence to custom and past experience. For the most part, the divisions have been based on the principle of equal contributions—50–50, by the central and other governments regardless of the type of projects to which they were applied. In some instances special fees, charges, or assessments were made for special services or benefits. When Federal undertakings were of more limited scope, these divisions were more satisfactory than they are today. Now, public works range from local paving, sewer, waterworks, or similar improvements, to vast drainage, irrigation, flood-control, or power projects affecting a large section of the Nation. With so wide a difference in the scope and type of projects as now exists, the rough and ready apportionments of the past are not always appropriate, especially in times of economic emergency.

The present-day problem is threefold—(1) the systematic preplanning and sound financing of long-time public-works programs in ordinary times; (2) in depression periods; and (3) the interrelation of the two. It must always be borne in mind that war emergencies have been an upsetting factor in public-works policies; and due allowances for such crises must be made in organizing public-works plans and authorities.

Preplanning and programming of public works of the type indicated in the National Resources Committee's reports on drainage basins and on a wide range of other enterprises will go forward, it is hoped, on a sounder basis than ever before.[1] Whatever the amounts expended upon works—Federal, State, and local—these outlays will be better organized, with less overlapping, less confusion, and less waste, both in money and in terms of useful public services. If a permanent national development or public works au-

[1] See National Resources Board of 1934, pp. 42 to 62.

thority is set up as here recommended, or other like organization, the tasks both of long-time planning and of administration will be greatly facilitated.

But, further, it is believed that in the future public works may be widely utilized as one phase of an economic stabilization program. On this basis the effects of public-works construction upon the business cycle will then be emphasized. The construction of projects will be expanded in emergencies, with a lesser program provided for other periods. Such a conception of public works has an important bearing upon divisions of cost, for at certain times the secondary effects, such as reemployment, will be more important than at other periods, though the value of improvements in themselves must always be considered. At other times the secondary effects will be unimportant and the direct values of projects will be primary. This becomes the more important because the capacity of local agencies to finance public works is least at precisely the time of the greatest need for an expanded program. At all times the public-works policy must be harmonized with the general fiscal policy of government.

It is difficult to see how the old system of arbitrary apportionments can be applied either to long-time planning of works or to employment stabilization without modification in procedure and in substance. A different apportionment will be necessary in periods of depression from that used at other times. Many new factors must now be taken into account and new formulae must be appropriate to the projects to which they are applied. It therefore appears necessary, as soon as practicable, to place these determinations of cost divisions in the hands of administrative agencies who will weigh and balance all the factors. Consequently it is recommended that the authority of the Federal public works agency to which is assigned the development of a public-works program should include not only the listing of the physical and engineering features of each approved project but also the recommendations for a division of its cost.

This entire program should be worked out cooperatively with representatives of all units of government involved in the costs of the projects, assisted by panels of competent authorities. This will mean that the plans for public works will include the form of future financing. Impartial boards or panels of assessors or appraisers might be set up in some instances, and authorized either to decide the ratio of financial burdens for the several localities, or at least to make advisory recommendations, which presumably would be followed. In some cases the device of the interstate compact might usefully be employed.

An adjudication by persons of competence with technical knowledge of the necessary kinds of facts might provide a way out of many difficult situations. Settlement might conceivably be brought about by judicial determination, but often time is of the essence of the contract and an administrative procedure might for this reason be preferred. Such impartial assessors might be appointed either by the United States Government alone, or by the different authorities acting in cooperation. Obviously none of the authorities is bound to pay what seems to it more than a fair share of the improvement cost, and, unless agreements are reached, the project will simply not go forward.

As the considerations applicable to a scheme of division of costs must contain so great an element of judgment, the Congress need not delegate all authority over public-works costs to an administrative agency no matter how wise or competent it might be. The Congress might appropriately fix definite categories of expenditures and as to some of them require contributions within defined limits by cooperating governments. But within limits, amounts would be fixed by the public-works agency after administrative adjustment. Thus the policy, limits, and framework for the apportionment of costs could be specified by Congress allowing ample freedom at the same time for administrative determination of the details. Within such a framework the administrative authorities could develop equitable policies with reference to the division of costs. For the present, until such a careful division of costs can be worked out in detail, the percentage divisions and other arrangements which have become customary could be used.

Among the factors relevant to the determination of cost division are the following:

(*a*) The type of project, with reference to which the interests of particular governments, national or local, are appraised. Such interests are usually estimated according to some rough appraisal of benefits to the citizens of the territories affected.

(*b*) The degree of administrative authority and responsibility in the planning, supervision, and execution of projects appropriately lodged with particular governments.

(*c*) The ability of various governments to assume costs, either via taxation, borrowing, or the exchange of services as may be appropriate.

(*d*) The phase in the economic cycle in which the project is to be undertaken.

The exact weight to be ascribed to these factors cannot be made a matter of general rule. But if the cooperating units have a voice in their determination, and if expert advice is secured, it is believed that more equitable divisions of cost can be effected than if the allocations are fixed by legislative action alone. The rigidity of such determinations is replaced by flexible administrative decisions. Abuse of such authority can

be safeguarded by limitations and declarations of policy prescribed by Congress.

In order to enable the administrative agency to plan wisely for the future, as well as to profit by the mistakes of the past, a thorough and impartial inquiry into the capital improvement program of the recent depression should be undertaken. This should include the results and experiences of the Civil Works Administration, Public Works Administration, Works Progress Administration, Reconstruction Finance Corporation, Federal Emergency Relief Administration, and other agencies. A thorough analysis of the grant-in-aid policy should also be made, including the results of the policies of apportioning grants and the matching of funds.

Inasmuch as the ability of subordinate governments to assume financial obligations for public works is inevitably connected with any divisions of cost that are developed, plans for the future should include not only a thorough inquiry into Federal, State, and local finances but an attempt to correct those conditions which have prevented subordinate governments from carrying a fair portion of the load during the past depression. The problems of finance and of intergovernmental relations can thus be brought into clear relief. Unless improvements are made in these fields in the near future, planning for the future as to public works will be seriously handicapped. This inquiry should be the task of a national authority, with broad powers of inquiry, an adequate staff, and an ample budget. It should also be a cooperative undertaking of the Federal, State, and local governments; otherwise questions of jurisdictional authority would hamper its work.

So important is the complete coordination of fiscal policy and public-works financing and timing with the monetary and credit policy of the Nation that it is proposed that final review and recommendations in this field be made by a fiscal advisory committee appointed by the President. This fiscal advisory committee would advise as to the manner in which public funds shall be provided at any particular phase of the economic cycle, and correlate the timing of public works with other Federal fiscal policies.

For any correlation of Federal fiscal policies with fluctuation in governmental spending or with the problems of unemployment, the amount of Federal as compared with State and local spending is a major factor. The totals which the standard or customary division of costs would assign to Federal and to non-Federal accounts must be considered as well as refinements made necessary from a fiscal point of view. These shifts in totals may be accomplished through a selection of projects in relation to the emergency or by such percentage or other changes in the standard divisions as may be within the limits imposed by Congress.

These proposals for handling the problems of division of costs will in the first place allow of a more just and appropriate distribution of burden than the fixed overall percentage system could possibly accomplish. In the second place, they will make possible orderly adjustments to the variations in local "ability to pay" which always occur with the changes in general business activity. They therefore conform to a long-range program for the utilization of public works as one instrumentality in our fight for stabilization and against the evils of unemployment and depression.

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PART II
DRAINAGE BASIN PROBLEMS AND PROGRAMS

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Foreword

The investigation on which this report is based was undertaken, at the request of the President, with a view—

(1) To determining the principal water problems in the various drainage areas of the country,
(2) To outlining an integrated pattern of water development and control designed to solve those problems, and
(3) To presenting specific construction projects and investigation projects as elements of the integrated pattern or plan, with priorities of importance and time.

The project lists embodied in the report provide a reservoir of meritorious undertakings intended to cover a period of 10 or more years, but the program is readily adjustable to the requirements of any policy that may be adopted with respect to either the rate or the mode of public expenditure, whether Federal or non-Federal, on water resources. The project lists do not constitute a fixed or final program. Year by year adjustments in the program will be needed in the light of new knowledge, shifting needs, and perhaps of altered policies.

It is a highly significant fact that this report represents the first coordinated attempt to formulate a Nation-wide water plan and program through the joint efforts of Federal, State, and local agencies, official and nonofficial. The National Resources Committee approves of the essential approaches to the complicated and fundamental problems of water resources in their relationships to land use and other resources as set forth in the report, and emphasizes anew the necessity of appropriate provision for continued cooperative investigation for many of those problems in their interlocking relationships one to another. Water and land are the principal material foundations of our civilization. The Nation depends in no small measure upon the effectiveness with which they are conserved and used for the greater good of the greater number.

National Resources Committee

November 9, 1936.

Interior Building
Washington

Mr. Frederic A. Delano,
Vice Chairman, National Resources Committee,
Interior Building, Washington, D. C.

My Dear Mr. Delano:

The Water Resources Committee submits herewith a report on Drainage Basin Studies in the United States. These studies were undertaken early in 1936 at the request of the National Resources Committee, with the following objectives:

(1) To determine the principal water problems in the various drainage areas of the country,

(2) To outline an integrated pattern of water development and control designed to solve those problems, and

(3) To present specific construction projects and investigation projects as elements of the integrated pattern or plan, with priorities of importance and time.

The findings of the investigation are reasonably clear on the first and second items of the assignment. The third item presented special difficulties, particularly since it necessitated review and appraisal by the Committee of thousands of projects, aggregating billions of dollars in estimated cost and relating to water-resources development during a period of some 10 years. It was impossible in the time available for all members of the Committee to pass on all the projects. Individual responsibility of members of the Committee for final classification is therefore not to be assumed.

Action on certain highly controversial projects was deferred either because there was not time for an adequate review of the complex and, in some instances, voluminous material involved, or because data essential to sound action were lacking. In the latter case, further investigation was recommended. Completion of certain projects already constructed in large part was recommended even though their original merit appeared to be gravely in doubt; abandonment of them now with little or no salvage seemed wholly impracticable. Investigations under way and construction projects contingent upon a favorable outcome of investigations in progress or now recommended are not listed in most instances.

The study has been carried out through cooperative efforts of the Washington and field staffs of agencies represented directly on the Water Resources Committee,

and of the Bureau of Agricultural Engineering, Bureau of Indian Affairs, Forest Service, Grazing Division, International Boundary Commission, Resettlement Administration, and other Federal agencies concerned with problems of water use and control.

The preparation of the document herewith submitted would have been impossible without the support of State planning boards and other State agencies. The conscientious and tireless efforts of the regional water consultants likewise made the document possible. They have contributed in time and energy to an amazing degree to whatever success this preliminary study may attain. Their names follow: H. K. Barrows, Wesley W. Horner, Walter L. Huber, Nathan B. Jacobs, Gerard H. Matthes, Ralph I. Meeker, Samuel B. Morris, William McKinney Piatt, LeRoy K. Sherman, J. C. Stevens, Royce J. Tipton, Blake VanLeer, N. W. Bowden, and Fred H. Weed.

To the director of the drainage basin study, Frederick H. Fowler, and his headquarters staff, the Committee expresses its wholehearted appreciation for their continued patience and strenuous activities in the completion of this arduous task.

Respectfully submitted.

ABEL WOLMAN

Chairman, Water Resources Committee
Chief Engineer, Maryland State Department of Health

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Chief Hydraulic Engineer
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R. E. TARBETT
Senior Sanitary Engineer
U. S. Public Health Service

THOMAS R. TATE
Chief, Division of Power Resources and Requirements
Federal Power Commission

SHERMAN M. WOODWARD
Chief Water Control Planning Engineer
Tennessee Valley Authority

NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
WATER PLANNING DISTRICTS
1936
PACIFIC NORTHWEST
CALIFORNIA
THE GREAT BASIN
COLORADO BASIN
UPPER RIO GRANDE
MISSOURI BASIN
UPPER MISSISSIPPI
RED RIVER OF THE NORTH
GREAT LAKES ST. LAWRENCE
OHIO BASIN
TENNESSEE VALLEY
SOUTHWEST MISSISSIPPI BASINS
WESTERN GULF
LOWER MISSISSIPPI
SOUTHEAST
NORTH ATLANTIC
MIDDLE ATLANTIC
NEW ENGLAND

The Assignment

The Water Resources Committee of the National Resources Committee was instructed last winter to undertake a national drainage-basin study and to report the results for transmittal to the President on December 1, 1936. The investigation had three major objectives:

(1) To determine the principal water problems in the various drainage areas of the country,

(2) To outline in broad terms an integrated pattern of water development and control designed to solve those problems, and

(3) To present specific construction projects and investigation projects as elements of the integrated pattern or plan, with general priorities of importance and time. Some of the projects are Federal, others State, and still others local in character.

The Procedure

To accomplish the task indicated, the Water Resources Committee set up a special organization involving as key members a director and 14 regional water consultants, each of whom had immediate responsibility for the conduct of the investigation, as planned by the Water Resources Committee, in one or more drainage basins. On the one hand, the organization worked as closely as practicable with all Federal agencies that deal in one way or another with water resources and water problems, availing itself fully of relevant data, published and unpublished, obtainable from them. On the other hand, it cooperated closely with State planning boards, with other State agencies and officials, and with local organizations, utilizing so far as possible the information they provided and profiting greatly from their active assistance.

For several reasons the investigation was decentralized to as great a degree as practicable, and, as already noted, State and local agencies were given full opportunity to participate. (1) It was evident that such a procedure would tend in greater degree than any other not only to insure a truly national water plan but also to serve both private and public interests. (2) It was obvious that the Federal Government could not impose any integrated water plan on the States, even were it disposed to do so, since the control of inland waters rests in large part with the several States. (3) Every State has responsibilities, no less than rights, in its waters, and these responsibilities cannot properly be shifted to the Federal Government. (4) No general water plan, however admirable in theory, could be put into action successfully that did not represent close cooperation between the Federal Government and appropriate State agencies. The investigation recognized, it may be added, that such cooperation is needed on both sides. An individual State might solve various problems presented by streams lying wholly within its own territory without Federal aid in planning or execution, but neither an individual State nor a group of States could satisfactorily solve without Federal participation the problems of an interstate river or river system. Throughout the country, many of the major problems of surface waters are interstate, not intrastate, in character.

The regional water consultants, all of whom are engineers of high competence and long experience, have embodied their own findings and recommendations in the 127 basin reports submitted by them, and the Water Resources Committee, in turn, is responsible for the basin reports published in an accompanying volume. The full reports and all relevant data in hand are in the files of the National Resources Committee.

This drainage-basin study supplements and extends the work of the President's Committee on Water Flow (1934), the Mississippi Valley Committee of the Public Works Administration (1933–34), and the Water Planning Committee of the National Resources Board (1934–35).

Need for a Water Plan

With respect to water, people have been concerned, for the most part, only with their own immediate interests in particular types of problems. In planning the storage of water for irrigation in the arid West, the possibilities of concomitant power development have not always been emphasized. In planning the drainage of lands for agricultural use in the humid East, the possibility of injury to other interests affected by the behavior of water commonly has been ignored. Far too often in all sections of the country the control of a stream subject to destructive floods, the improvement of a river channel for navigation, the procurement of water from a stream for municipal and domestic use, the disposal of sewage and industrial waste in a drainage channel, or other concern in the use or control of water, has been treated as an isolated problem, in disregard both of the inherent relationships between various types of water problems and of the possibilities of multiple-purpose development. Too often, also, specific water problems have been treated solely in terms of

particular localities, urban or rural, with resultant injury to other localities on the same river system. Water development in general has been haphazard.

During the last few years it has become increasingly apparent that such orderless, unintegrated treatment of water problems, however natural and excusable it may have been under pioneer conditions, should no longer be tolerated. Water, though at times a merciless enemy of man, is perhaps the most precious natural resource of the Nation. The supply of water for essential purposes, available and potential, on the surface and underground, is strictly limited, though it varies from time to time at a given place as well as from place to place at a given time. The further development of large areas in all sections depends even now in considerable part on the extent to which the supply of available water can be increased by storing surface water, by pumping ground water, or by other means. Soon or later, wasteful use of water must cease. Soon or later, the maximum supply of water that can be made regularly available in each drainage area must be put to its best coordinated use.

Under these circumstances it would be unwise to depend solely on the long-run tendency of economic conditions to bring about the use of water in the places and ways in which it would have greatest value. The process would be far too slow and far too costly. Moreover, the sum total of individual and local interests in the waters of a drainage area may differ greatly from the best interest of the public at large in their use. Still further, continued uncoordinated development of waters might presently preclude in many basins their later control and utilization in an orderly, balanced manner conducive in greatest measure to the general welfare. The inherent conflict of interests in water, between private users, between private and public organizations, and even between public agencies, increases year by year. From every point of view, a practicable water development program that can be put into action promptly is needed in each river basin of the country. A plan without action is useless; continued unplanned action would be foolhardy.

Limitations of a Water Plan

No fixed or final water plan is possible. Future water requirements in most areas can be estimated only approximately and for comparatively short periods. They will be affected by changes in density of population, in land use, in industry, and in social conditions. From time to time emphasis doubtless will be placed upon different uses and problems of water. The nature and extent of future changes of these kinds will be influenced in turn by the supply of water. The supply now available may be insufficient even for present needs. The extent to which it can be increased may be unknown for lack of basic data on precipitation, infiltration, stream flow, and the like. Such data are lacking to greater or less degree on both the surface and underground waters of almost every drainage area. The general removal of these deficiencies in hydrologic data will require many years even if adequate action to that end is initiated promptly, since long-term records are indispensable for many major purposes. The total supply of water that can be made available in a given drainage area may change through the operation of natural processes or through modification of surface conditions by human action. For these reasons, any water plan, no matter how frequently revised, must remain forever incomplete. Continuous planning is necessary.

The general water plan presented in this summary of the results of the current investigation and the plans for individual basins set forth in the accompanying volume involve many construction projects, and also many investigation projects, some Federal, others non-Federal, in character. The investigation projects relate in some cases to the extension or completion of investigations instituted earlier and in other cases call for necessary surveys or studies not as yet undertaken. Nevertheless, a framework of a national water plan is proposed that will permit early constructive action on sound lines along a broad front; a plan, moreover, that can be adjusted, filled in, and extended to meet changing conditions. A beginning has been made; the end can never be reached.

It is not assumed for a moment that the findings of the investigation or the recommendations based on them will all meet with general approval. The brevity and incompleteness of the study, the predilections of investigators, the paucity or complete lack of data on many pertinent subjects, the complexity of the varied problems involved, the attitudes dictated by local ambitions, the rivalries of different communities and regions, and the number and intensity of the conflicts in water claims alike preclude such a possibility. The limitations of the plan are inexorable.

Plan and Policy

Federal participation in an integrated plan to promote the efficient and equitable use and effective control of the water resources of the country for the greater good of the greater number of people will necessitate the adoption of a comprehensive Federal policy with respect to the various types of water problems in their interlocking relationships. There has long been a Federal policy concerning inland navigation, involving the improvement and maintenance of river channels at national expense for the free use of shippers; concerning the reclamation of west-

ern lands, involving the construction by the Government of irrigation works to be paid for ultimately by the water users; and concerning water powers on navigable streams and streams within the public domain, involving development by licensees. Recently, too, a Federal policy concerning flood control throughout the country was established by Congressional action. Without discussion of the merits or demerits of existing policy, it may be affirmed with confidence that a *coordinated* Federal water policy is now needed, not a collection of *unrelated* policies applicable respectively to individual types of water problems. Without such a new policy, the Federal Government cannot contribute effectively or equitably to the integrated development and control of water resources.

A sound water policy will have, it is believed, the following characteristics:

1. It will be concerned, in the final analysis, not with water *per se*, but with the promotion of public safety, public health, the public convenience and comfort, the economic welfare of the public, the establishment or maintenance of a high standard of living.

2. It will seek to promote the maximum integrated use and control of water, within the shifting limits imposed by considerations of technical feasibility and of economic and social justification.

3. It normally will treat drainage areas as units with respect to their waters in recognition of the train of connected problems that runs from river source to river mouth, from countless rivulets along the highland rim of the largest basin to the distant point where its master river enters the sea.

4. Though treating drainage areas as units, it will scrupulously observe the rights of the several States both in intrastate and interstate streams, seeking through cooperation to promote the full use of water in the best ways and in the proper places.

5. It will recognize and abide by the axioms that facts are indispensable prerequisites to sound action with respect to water, and that conclusions and commitments not based on predetermined facts almost certainly prove indefensible. In keeping with this recognition, it will promote by all feasible means continuous assembly of the basic data essential for an evolving, unending water plan. At the risk of repetition, the statement may be made categorically that the adoption of a plan and program for the use and control of the waters of any river basin without a definitive study of adequate data bearing on all phases of the interlocking physical and cultural problems involved would be illogical, would result in economic waste, would invite controversy, and might preclude desirable action later. As already noted, controversies over water multiply. They are most likely to arise where pertinent facts are least known. An enlightened water policy will seek to obviate controversy by substituting facts for opinion.

6. It will assign the cost of constructing and operating projects undertaken from time to time as suitable elements in an evolving water plan among the agencies concerned in as close accordance as possible with the distribution of benefits. The proposition that those who will profit from a given undertaking normally should pay, in a manner not involving avoidable or undue hardship, in proportion to the advantage they will reap should be the basic principle of action.

7. In determining whether or not water projects are justifiable, and in distributing the costs of meritorious projects among the beneficiaries, it will take properly into account social benefits as well as economic benefits, general benefits as well as special benefits, potential benefits as well as existing benefits, wherever they are involved. Some of these benefits are not capable of measurement, and accordingly they commonly have been ignored in the past in evaluating certain types of enterprises. They are subject to reasonable appraisal, however, and their intangible nature will not justify their neglect in the future. In great measure, they concern the public at large. A public water policy should assiduously conserve and promote public interests. To this end, social accounting must take its place with economic accounting. As effective water planning proceeds year after year without interruption—planning based on fundamental and exhaustive engineering, economic, and social studies that cover all relevant conditions—there inevitably will result not only a clearer understanding of what constitutes the public interest, but also a greater opportunity to promote it through equitable control and orderly development of water resources.

Program and Plan

Since all the projects in a comprehensive water plan cannot be undertaken simultaneously, a program involving priorities is necessary. Many considerations may influence the judicious establishment of priorities among the projects of any given area. They are likely to relate to such matters as the quantity and reliability of the pertinent basic data in hand; the relationships of benefits and costs; the nature, relative desirability, number, and scope of the benefits respectively involved; relative urgency; the situation with respect to relevant nontechnical factors; relationships to the later stages of an evolving water plan; and the present status of the various projects under review. Since these factors present themselves in numerous combinations; since some projects are single-purpose enterprises, others dual-purpose, and still others multiple-purpose; and since the relative weight of a factor of a given type may vary much from one part of a large drainage area

to another, the problem of priorities in importance and time is complicated and difficult.

In general, preference has been given in the present study to investigation projects designed to afford information indispensable for proper action later; to construction projects for which adequate and reliable data are available; to projects involving benefits that exceed costs in relatively high degree; to multiple-purpose projects having relatively high social values for comparatively large numbers of people; to projects of immediate, rather than prospective, urgency; to projects not likely to be delayed by legal and other nontechnical complications; to projects which it is believed would fit properly into a comprehensive water plan when it shall have reached a later and more detailed stage; and to projects already authorized by the Congress or now under way.

The application of the foregoing criteria, one by one, to a group of projects in a given area may result in findings not in harmony one with another. Projects of dissimilar character may not be comparable on any satisfactory basis. In the final analysis much depends on the judgment of the investigators responsible for the grouping adopted.

It was found impracticable and undesirable to assign absolute priorities to projects for the country as a whole, for regional groups of drainage basins, or even for individual basins. It was feasible, however, for individual basins and for groups of basins, to classify projects in three broad groups, a procedure deemed adequate for all practical purposes. The groups adopted were as follows:

Group A (immediate).—Projects which are ready for construction or study and which should be undertaken as soon as possible.

Group B (deferred).—Projects which, while desirable for immediate construction or study, (*a*) involve unsolved questions of public policy or (*b*) can have their priority definitely determined only after additional studies which cannot be completed in time for this report or (*c*) are now obstructed by legal, administrative or other difficulties. Group B also includes projects which should follow Group A in sequence of construction or of study.

Group C (indeterminate).—Projects which, although included in the plan of development for the basin, should follow Group B in sequence of construction or whose specific priority in the program is as yet indeterminate.

In this summary of the drainage basin study the projects of Group A and Group B are presented in a series of tables, one for each of the districts into which the country was divided for convenience. The districts adopted are the following:

New England.
North Atlantic.
Middle Atlantic.
Southeast.
Tennessee Valley.
Ohio Basin.
Lower Mississippi.
Western Gulf.
Southwest Mississippi Basins.
Upper Mississippi—Red River of the North.
Great Lakes—St. Lawrence.
Missouri Basin.
Colorado Basin.
The Great Basin.
California.
Upper Rio Grande.
Pacific Northwest.

The locations of the projects are shown on a corresponding series of district maps. The projects of Group C may be found in the basin reports of the accompanying volume.

The projects listed under these groups deal with problems of water use and control for:

Bank and coastal erosion control.
Domestic and industrial water supply.
Drainage.
Flood control.
Generation of electric power.
Irrigation.
Navigation.
Recreation.
Soil conservation and forest development.
Waste disposal and pollution abatement.
Wildlife conservation.

Basic Needs and Problems

Many of the basin reports emphasize the urgent need, already noted in this summary, for basic hydrologic data now lacking, and some of them also stress the pressing need for completion at an early date of the mapping of the United States.

A recent report on *Deficiencies in Basic Hydrologic Data* (United States Government Printing Office, 1936), prepared by our Special Advisory Committee on Standards and Specifications for Hydrologic Data, presents recommendations for increasing and making available information on rainfall, snowfall, stream flow, underground waters, losses of water by evaporation, the quality of surface and underground waters, and the like. The importance of the matters with which the report deals cannot be exaggerated. Unless existing facilities for gathering hydrologic data are increased along the lines recommended by the Special Advisory Committee and, in general, to the extent proposed by it, progress in dealing with water resources will be retarded more and more as years pass. The costs of ignorance, already heavy, will mount rapidly. Accordingly, expenditures, adequate but moderate, are recommended to implement a remedial program.

Topographic maps are indispensable tools not only for dealing with most water problems, but also for other purposes in countless number. Adequate topographic maps are now available for little more than one-fourth of the area of continental United States, exclusive of Alaska. Almost another fourth was mapped more than 40 years ago by methods and on scales wholly inadequate for most present needs. Approximately half the entire area remains to this day entirely unmapped topographically. Suitable allotments of Federal funds for mapping are recommended in accordance with the current program of the Board of Surveys and Maps.[1]

Broadly speaking, problems relating to the use and control of water merge imperceptibly into problems concerning the use and protection of land. Water planning and land planning cannot properly be separated. This fact is reflected in various basin reports in connection especially with *soil erosion and forestry.* In most cases these reports treat very briefly and only in a general way of one or both of these collateral subjects. This treatment does not mean, however, that the great importance of both subjects is not recognized. Soil erosion is a serious menace to public welfare. Deforestation and overgrazing have contributed mightily. Soil washed from the fields and pastures upon which the Nation chiefly depends for its food tends to fill reservoirs, clog stream channels, and shoal harbors. Agriculture, industry, and commerce all are injured. Prevention of excessive erosion is imperative. Its prevention would directly or indirectly affect many problems of water as well as many aspects of land occupation and land use. Unfortunately, precise knowledge is lacking concerning many of the quantitative relationships involved. Unbiased, scientific research is particularly needed to determine in representative areas of considerable size the relationships of vegetal cover and cultural practices to yields of water. The research should be undertaken cooperatively by the various agencies concerned with the problem, thus insuring diversity of viewpoint in both the collection and the interpretation of data.

Finally, the various basin reports clearly indicate a basic need for investigations of the engineering and economic aspects of the production, transmission, and marketing of power in inter-basin areas in different parts of the country, with a view to setting up feasible programs for the integration of existing facilities and for the construction and operation of new water-power facilities coordinate with navigation, flood control, and other relevant uses and problems of water.

As time passes and needs and views change, various subjects not immediately related to the use or control of water and not considered here may win places of more or less prominence in an evolving water plan.

[1] For list of organizations endorsing such a program, cf. Report of the National Resources Board, Dec. 1, 1934, p. 451.

Recommended National Data-Collection and Investigation Projects

A. Collection of Basic Hydrologic Data

	Cost					
	First year			Succeeding years		
	Federal	Non-Federal	Total	Federal	Non-Federal	Total
1. Precipitation	$396,000		$396,000	$223,000		$223,000
2. Snow surveys	169,000	$39,000	208,000	58,000	$12,000	70,000
3. Stream flow	1,450,000	450,000	1,900,000	370,000	120,000	490,000
4. Ground-water levels	406,250	131,250	537,500	312,500	112,500	425,000
5. Evaporation	35,000		35,000	16,000		16,000
6. Water quality	450,000	150,000	600,000	450,000	150,000	600,000
Total	2,906,250	770,250	3,676,500	1,429,500	394,500	1,824,000

B. Topographic Mapping

A revised program for topographic mapping for the United States is now in preparation in compliance with Senate Resolution 281 of the Seventy-fourth Congress. The program recommended by the Board of Surveys and Maps on October 29, 1934, was of the order of $117,500,000 for a 10-year period. New cost estimates are not yet available.

C. Vegetal Cover and Soil Erosion Control

Quantitative studies of effect of vegetal cover and soil erosion upon hydrologic phenomena, with particular reference to silting of reservoirs and stream flow. Annual cost for 5-year period, $250,000.

D. Power Market Surveys

1. Southeastern States	$150,000
2. Middle Atlantic States	75,000
3. Upper Ohio Basin	250,000
4. Pacific Northwest	100,000
5. Pacific Southwest, including northern and central California	50,000
Total cost	625,000

E. Coastal Erosion Studies

Investigation of coastal erosion and the effects of beach protection works in selected localities. The relationships among beach profiles, offshore bars, sand movements, physical properties of beach material, waves, tides, and weather should be investigated in the field and in laboratories. Total cost, $250,000.

F. Extension of Specific Drainage Basin Studies

Detailed investigations of basins, where critical water problems are pressing, to extend information beyond that now available and to provide bases for interstate action on permanent programs for use and control of water. Total cost, $2,500,000.

Recommendations

The Water Resources Committee submits in the following tables and maps desirable projects for further investigation and projects which are ready for construction. It includes a list of projects which are now under way and which should be completed. The estimated cost of the projects in Group A–1 is approximately $20,000,000, in Group A–2, $1,727,000,000 and in Group B, $1,024,000,000. With respect to certain large projects, only part of the requisite expenditure is shown in the cost column of the project lists involved. The additional sums needed to complete the projects are shown in the "remarks column." The aggregate sum needed to complete A–2 projects is $600,000,000 and to complete B projects is $400,000,000.

The lists provide a reservoir of meritorious undertakings in the field of water resources that should fit during a period of years, perhaps a decade, into an integrated pattern of drainage basin development. The plan and program are readily adjustable, however, to the requirements of any policy that may be adopted with respect either to the rate or the mode of public expenditures on water resources. Both plan and program should be subject to continuous modification in the light of accumulating knowledge and shifting requirements.

Neither the plan nor the program rests upon any assumptions as to how the proposed developments should be financed or administered. It is obvious, however, that the effective fulfillment of such a comprehensive water plan is contingent upon the effective solution from time to time of the pressing problems of financial and administrative policy.

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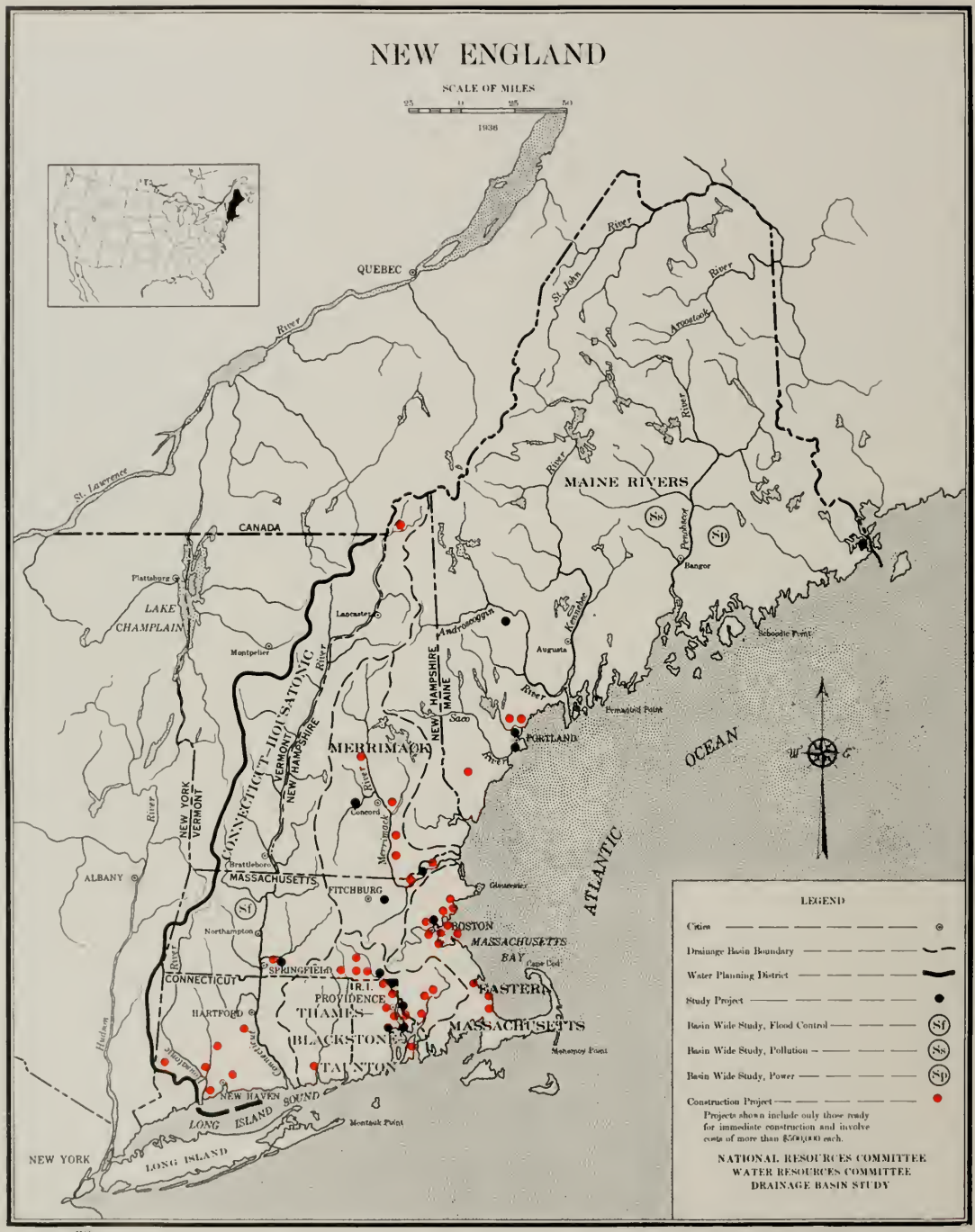
NEW ENGLAND
SCALE OF MILES
25 0 25 50
1936
QUEBEC
St. Lawrence River
CANADA
MAINE RIVERS
St. John River
Aroostook River
Penobscot River
Kennebec River
Androscoggin River
Saco River
Merrimack River
Connecticut River
Hudson River
Housatonic River
Thames River
Blackstone River
Taunton River
Bangor
Augusta
Portland
Pemaquid Point
Schoodic Point
Plattsburg
LAKE CHAMPLAIN
Montpelier
Lancaster
Concord
Brattleboro
Northampton
Springfield
Hartford
Fitchburg
Gloucester
Boston
Cape Cod
Albany
Montauk Point
Mohegan Point
NEW YORK
LONG ISLAND
NEW HAVEN SOUND
LONG ISLAND SOUND
MASSACHUSETTS BAY
EASTERN MASSACHUSETTS
PROVIDENCE
R.I.
CONNECTICUT
MASSACHUSETTS
VERMONT
NEW HAMPSHIRE
MAINE
NEW YORK
VERMONT
MERRIMACK
CONNECTICUT–HOUSATONIC
ATLANTIC OCEAN
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Study Project
Basin Wide Study, Flood Control (Sf)
Basin Wide Study, Pollution (Ss)
Basin Wide Study, Power (Sp)
Construction Project
Projects shown include only those ready for immediate construction and involve costs of more than $500,000 each.
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

NEW ENGLAND

The water problems of New England are most acute in its great manufacturing belt of dense urban population between southern Maine and western Connecticut. Chief among them are flood control and pollution abatement.

The unprecedented floods of 1936 caused damages estimated at $15,000,000 in the Merrimack Valley and $50,000,000 in the Connecticut Valley. They inflicted damages in various other valleys, which, though not so high, established local records. These disasters focused public attention upon the urgent need for adequate protection against major floods and made the immediate determination of the best solution of the problem a matter of prime importance.

Flood control in New England must be approached not as an isolated problem, but as one of several benefits, including power development, improved sanitation, enhancement of recreational opportunities, and betterment of streams for navigation, that may result in combination from the construction of storage reservoirs to collect flood waters and release them later in relatively dry periods. The necessity for approaching the problem in this manner arises from the fact that reliable studies of the frequency of floods and of resultant damages indicate the latter may not alone justify the cost of the reservoirs needed to eliminate such damages. This is true despite the availability of many favorable sites for new reservoirs and the possibility of utilizing for storage numerous lakes and ponds, by controlling their outlets. Storage reservoirs accordingly must be built both for power and for flood protection consistent with provisions for adequate financing and reimbursement for project costs, where material power development does ensue. Experience in New England has confirmed the value of power-storage reservoirs in this respect. It is assumed that such reservoirs would be intelligently and adequately operated under the direction of a suitable agency.

A system of reservoirs in the Connecticut basin with about 1,120,000 acre-feet of storage controlling the run-off from about 53 percent of the drainage area would provide reasonable flood protection in the valley. Such a system can be built for approximately $40,000,000. Of this amount, only part is justified for flood control and the remainder must be carried by reservoir power values and the other benefits of regulated flow.

Adequate control and regulation of the Merrimack River can be obtained with a reservoir system costing from 11 to 18 million dollars, of which only part may properly be allocated to flood control and the remainder chiefly to power with some sanitary and recreational benefits.

The solution of this problem on interstate streams, such as the Connecticut and Merrimack, will require effective coordination and cooperation of Federal, State, and local agencies. Connecticut, Rhode Island, Massachusetts, New Hampshire, and Vermont, recognizing the necessity for cooperative action in these matters, have appointed interstate compact commissions which are empowered to draw up compacts dealing with the development of streams common to two or more of the States. At present, these commissions are jointly engaged with the New England Planning Commission in formulating compacts dealing with the Connecticut River and with the Blackstone River.

Pollution abatement, as already noted, is also a problem of major importance. Many rivers in this district are used as conduits for the disposal of sewage and industrial wastes by the communities along their courses. In many instances, pollution has impaired the usefulness of the rivers for industrial water supply and for recreational purposes and also has virtually destroyed fish life.

In the river valleys now devoted chiefly to industry restoration of the surface waters to a state of natural purity would involve expenditures far in excess of the benefits which could be realized. For the immediate future, at least, the program of stream sanitation should be limited to the elimination of nuisances, to the removal from sewage and wastes of the more objectionable deposits and scum-forming ingredients, and to the maintenance of a standard of quality at which the waters may be used satisfactorily for process purposes by the industries after treatment by conventional purification methods.

The upper tributaries of many New England rivers are used for domestic water supplies and for recreational purposes. Pollution along these headwaters is, in general, under reasonable control and further contamination should be prohibited. The cities along most of these upper streams are of moderate size and as a rule do not themselves contribute sufficient sewage to overtax seriously the diluting capacity of the streams. There are a number of borderline cases, however, where pollution is close to the limits generally accepted for avoidance of objectionable sanitary conditions.

Along the coastal waters, measures should be taken to protect the shellfish and recreational areas from the damaging and unhealthful effects of sewage contamination.

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There has been a pronounced movement of population from the larger cities into suburban communities, with the result that the extension of sewers has frequently not kept pace with other developments. In consequence, there are many towns where sewer extensions are needed to prevent further contamination of water resources.

On the whole, public water supplies in New England are of good quality and adequate for present purposes. The water is taken, for the most part, from natural and artificial reservoirs, but, in a few instances, rivers and wells serve as sources of supply. The water-supply problem pertains almost wholly to extension of existing works for domestic use or for fire protection. Some towns which have relied upon private wells have grown to such a size that provision of new supplies is probably justified to protect health and property.

Dredging of certain ship channels and anchorages and construction of breakwaters, jetties, and seawalls to protect sandy beaches from erosion constitute additional problems. The recreational facilities afforded by the water areas, though already great, doubtless will merit further improvement as the vast recreational industry of New England continues to grow.

New England Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Maine Rivers:		
Pollution:		
Androscoggin River, Maine and N. H.: Engineering investigation of stream pollution covering both industrial and domestic wastes.	$25,000	Survey to develop comprehensive plan and costs for abatement of pollution.
Maine: Study of all other rivers in Maine as well as coastal waters for pollution control	40,000	
Old Orchard, Maine: Study for sewage treatment plant	5,000	
Portland, Maine: Study of sanitary conditions in Portland Back Bay district	5,000	
Water power:		
Maine: Study of power and storage projects on the Androscoggin, Kennebec, Machias, Penobscot, Saco, St. Croix, St. John, and Union Rivers.	200,000	
Passamaquoddy-Eastport, Maine: Investigation and negotiation of international, construction costs and market aspects of proposed tidal-power development.	100,000	Contingent upon international cooperation.
Merrimack:		
Pollution:		
Merrimack River: Pollution study from Massachusetts line to mouth	25,000	To precede construction project.
Nashua River: Continuation of investigation of problem of sewage disposal of towns and industries on the Nashua River.	15,000	
Eastern Massachusetts:		
Pollution:		
Boston, Mass.: To determine a plan and program for relief trunk sewers and appurtenant works	75,000	Do.
Thames-Blackstone-Taunton:		
Navigation:		
Little Narragansett Bay, Newport Harbor, Pawtuxet yacht basin, Providence Harbor, Sakonnet Point Harbor, and Seekonk River, R. I.: Investigations of costs of dredging harbors.	25,000	Dredging is necessary, but no investigations yet made.
Study of canalization project between Hampton Harbor, N. H., and Gloucester Harbor, Mass.	25,000	
Pollution:		
Blackstone River Valley: Study of sanitation and pollution	25,000	
Central Falls, Cumberland, East Providence, and Pawtucket, R. I.: Study to determine relative merits of individual and district sewage treatment plants.	10,000	
Coventry, Johnston, Warwick, and West Warwick, R. I.: Study for sewer systems and sewage-treatment plants.	10,000	
Connecticut-Housatonic:		
Flood control:		
Connecticut River: Study of flood control and stream regulation	100,000	Preliminary study made, but further investigation necessary.
Pollution:		
Springfield, Mass.: Study for sewage treatment works	15,000	
2. Construction Projects		
Maine Rivers:		
Navigation:		
Corea Harbor, Maine: Dredging anchorage basin	44,000	Authorized by Congress.
Pollution:		
Ashland, Fort Fairfield, and Mount Desert Island, Maine: Sewer systems	201,000	
Auburn, Maine, Berlin and Gorham, N. H., and Lewiston, Maine: Sewage-treatment plants	800,000	Construction to await completion of Androscoggin River pollution study
Bangor and Old Town, Maine: Improvements to sewer systems	330,000	
Bar Harbor, Bath, Biddeford, Kennebunk, Old Orchard, Rockland, and Scarboro, Maine: Extensions to sewer systems.	227,000	
Conway and North Conway, N. H.: Sewer systems	185,000	
Exeter and Portsmouth, N. H.: Extensions to sewer systems	75,000	Preliminary studies made.
Portland and South Portland, Maine: Extensions to sewer systems	1,068,000	Preliminary study made.
Sanford, Maine: Extensions to sewer system, new pumping station, and treatment plant	1,000,000	Preliminary plans made and some construction already started.
Wilton and Winthrop, Maine: Sewer systems	120,000	
Water supplies:		
Ashland and Eagle Lake, Maine: New water supplies	65,000	Preliminary studies made.
Auburn, Augusta, Bath, Kennebunkport, Lewiston, Wells, and York, Maine: Extensions and improvements to water-supply systems.	648,000	Do.
Dover and Rochester, N. H.: Extensions to water-supply systems	287,000	Do.
Eliot, Mount Desert Island, and South Paris, Maine: Extensions to water-supply systems	201,000	Preliminary studies made.
Epping, N. H.: New water-supply system	40,000	Preliminary study made.
Portland, Maine: Extensions to water-supply system	2,088,000	Plans made.
Sanford, Maine: Extensions to water system	126,000	Preliminary study made.
Merrimack:		
Drainage:		
Middlesex County, Mass.: Swamp drainage for mosquito control and to improve sanitation	170,000	Preliminary studies made.
Flood control:		
Merrimack Valley: Reservoir system for flood control and stream regulation	11,250,000	Cost estimate rough and preliminary.
Pollution:		
Antrim, Bennington, Contoocook, East Jaffrey, Henniker, Hillsboro, Peterboro, and Warner, N. H.: Sewer systems and treatment plants.	344,000	Preliminary studies made.
Concord, Manchester, and Nashua, N. H.: Intercepting sewers and sewage treatment works	4,301,000	Cost estimate rough and preliminary.
Derry, Meredith, and Wolfeboro, N. H.: Sewer systems and sewage treatment	416,000	Do.
Franklin, Manchester, Nashua, and Pembroke, N. H.: Extensions to sewer systems	105,000	Preliminary plans made.

New England Project List—Continued

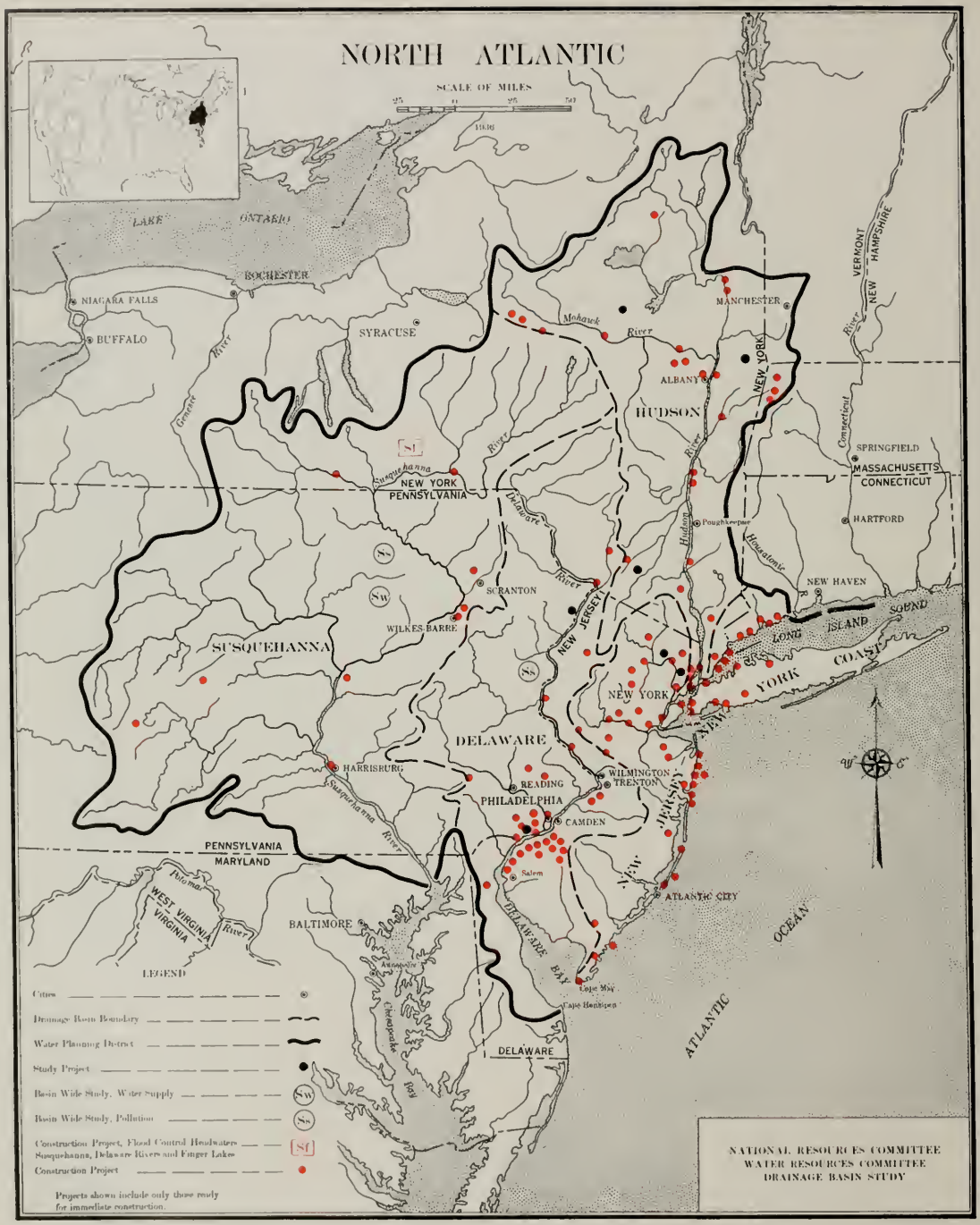
Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Merrimack—Continued.		
Pollution—Continued.		
Holden, Mass.: Sewer system	$125,000	Preliminary plans made.
Laconia, N. H.: Sewage treatment plant	400,000	Preliminary study made.
Lancaster, Mass.: Extension of sewage treatment system at State Industrial School for Girls	75,000	Preliminary plans made.
Merrimack Valley communities in Massachusetts: Sewage disposal facilities for communities covered by investigation project.	15,000,000	Should await completion of study project. Cost estimate rough and preliminary.
Methuen, Mass.: Extensions to sewer system	45,000	Preliminary plans made.
Tewksbury, Mass.: Extensions to sewer system	100,000	Do.
Westboro, Mass.: Sewage treatment system for Lyman School for Boys and State Hospital	83,000	Do.
Water supply:		
Amherst, Belmont, Bradford, Franklin, Hollis, Kingston, New Ipswich, Plaistow, and Rumney, N. H.: Water supplies.	400,000	Cost estimate rough and preliminary.
Andover, Clinton, Fitchburg, Framingham, and Leominster, Mass.: Extensions to water systems	663,000	Preliminary plans made.
Bedford, Bolton, Harvard, Holden, Lancaster, Princeton, Rutland, Tewksbury, and Westminster, Mass.: Water supplies, extensions and improvements.	500,000	Cost estimate rough and preliminary.
Concord, Mass.: Water treatment	60,000	Preliminary plans made.
Franklin, N. H.: Dike around water filtration plant	25,000	Do.
Haverhill, Mass.: Water-supply extension and improvement	200,000	Cost estimate rough and preliminary.
Hooksett, N. H.: Waterworks system	93,000	Preliminary plans made.
Lawrence, Mass.: Extension to water filtration plant	600,000	Do.
Lowell, Mass.: Additions to water supply and filtration plant	651,000	Do.
Lunenburg, Mass.: Water-supply system	150,000	Do.
Methuen, Mass.: Water-supply extensions and filtration	470,000	Do.
Eastern Massachusetts:		
Drainage:		
Boston, Mass.: Drainage of fresh and salt water marshes along Neponset River and at other places in city of Boston.	236,000	
Erosion (coastal):		
Barnstable, Brewster, Chatham, Dennis, Duxbury, Edgartown, Falmouth, Harwich, Hull, Ipswich, Marshfield, Oak Bluffs, Orleans, Plymouth, Provincetown, Quincy, Revere, Sandwich, Scituate, South Wellfleet, Truro, Wellfleet, Winthrop, and Yarmouth, Mass.: Beach protection.	3,000,000	Preliminary surveys under way.
Boston, Mass.: Sea wall along Charles River, Boston Harbor	210,000	Preliminary survey made.
Gay Head, Marthas Vineyard, Mass.: Riprap cliffs along shore	336,000	Survey and study made, no plans adopted.
Sagamore, Mass.: Riprap shore at Manomet Point	576,000	Preliminary study made.
Swampscott, Mass.: Breakwater	220,000	Preliminary survey made.
Navigation:		
Boston, Mass.: Removal of ledge in channel from main ship channel to drydock at Army base	660,000	Final check survey needed.
Boston, Mass.: Dredging and rock removal in main channel in Boston Harbor	1,800,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $1,629,000.
Boston, Mass.: Dredging channel in Weymouth Fore River from Hingham Bay to river bridge at Quincy Point.	233,000	Authorized by Congress.
Boston, Mass.: Dredging channel in Weymouth Back River	60,000	Do.
Cape Cod Canal, Mass.: Deepening and widening channel from Cape Cod Bay to Buzzards Bay	6,714,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $3,100,000.
Edgartown, Mass.: Dredging channel from Nantucket Sound to deep water of inner harbor	21,000	Recommended in report of Chief of Engineers.
Lynn, Mass.: Deepening channel in Lynn Harbor	336,000	Authorized by Congress.
New Bedford, Mass.: Dredging and ledge removal in New Bedford and Fairhaven Harbor	142,000	Do.
Quincy, Mass.: Dredging Town River	550,000	Preliminary plans made.
Pollution:		
Danvers, Mass.: Sewer system	415,000	Do.
Fairhaven, Hingham, Holbrook, Mattapoisett, Medfield, Millis, Provincetown, and Wareham, Mass.: Sewer systems.	2,500,000	Cost estimate rough and preliminary.
Falmouth, Mass.: Sewer system	100,000	Preliminary plans made.
Ipswich, Rockland, and Sharon, Mass.: Sewer systems and sewage-treatment plants	725,000	Cost estimate rough and preliminary.
Plymouth, Mass.: Intercepting sewers and outfall works	750,000	Plans and cost estimates.
Randolph, Mass.: Sewer system	300,000	Preliminary studies commenced.
Salem, Mass.: Closed conduit for North River	649,000	Preliminary studies made.
Salem, Mass.: Sewage-treatment plant and pumping station	375,000	Do.
Saugus, Mass.: Sewer system and trunk sewer to city of Lynn	750,000	Preliminary plans and cost estimates made.
Weymouth, Mass.: Sewer system	1,550,000	Plans and cost estimates made.
Recreation:		
Barnstable, Bourne, Chatham, Duxbury, Gloucester, Mashpee, and Westport, Mass.: Public beaches.	850,000	For purchase of beaches and necessary adjacent property.
Water supply:		
Boston, Mass.: High-pressure-service mains to outlying districts	650,000	Plans made.
Boston, Mass.: Extensions to water mains	750,000	Do.
Cambridge, Mass.: Water filtration plant improvement	165,000	Construction plans made.
Danvers, Mass.: Water filtration plant	165,000	Preliminary study made.
Dartmouth, Everett, Marblehead, Quincy, Salem, Stoughton, Swampscott, Winchester, and Wrentham, Mass.: Extensions to water supply systems.	1,023,000	Preliminary plans made.
Dennis, Hamilton, and Sandwich, Mass.: Water supply systems	400,000	Cost estimate rough and preliminary.
Dover, Mass.: Water supply system	130,000	Do.
Essex, Mass.: Water supply system	140,000	Preliminary plans made.
Foxboro, Mass.: Extension to water supply system	80,000	Do.
Gloucester, Mass.: Reservoir, filtration plant, and water mains	325,000	Do.
Holliston, Mass.: Water supply extension	50,000	Do.
Medway, Mass.: Water supply extension	25,000	Do.
Norwell, Mass.: Water supply system	200,000	Do.
Rockport, Mass.: Water supply extension	35,000	Plans made.
Waltham, Mass.: Waterworks treatment plant	150,000	Preliminary study made.
Thames-Blackstone-Taunton:		
Drainage:		
Worcester County, Mass. Drainage for mosquito elimination	150,000	
Navigation:		
Fall River Harbor, Mass.: Widening channel for navigation	65,000	Authorized by Congress.
Taunton River, Mass.: Dredging channel for navigation	600,000	Do.
Thames River, Conn.: Deepening channel for navigation	820,000	Do.
Pollution:		
Baltic-Occum, Jewett City, North Grosvenor Dale, Stafford Springs, Stonington, and Taftville, Conn.: Sewage-treatment works.	600,000	
Blackstone, East Douglas, Millbury, Millville, and Uxbridge, Mass.: Sewer systems and sewage-treatment works.	2,235,000	Preliminary studies made.
Central Falls, Cumberland, East Providence, and Pawtucket, R. I.: Intercepting sewers and treatment works for these communities individually or as a district.	2,000,000	Rough estimate. Should await completion of study project of Pawtucket-Central Falls District.
Cranston, R. I.: Sewer system and sewage-treatment plant	4,000,000	Preliminary study made
Danielson, Conn.: Sewage treatment plant extensions	135,000	Preliminary plans made.
Fall River, Mass.: Intercepting sewers, treatment works, and outfall sewer	2,500,000	Do.
New London, Conn.: Sewage treatment	250,000	Preliminary study made.
Newport, R. I.: Sewer system extensions and sewage disposal improvements	2,000,000	Preliminary plans made.
North Kingston and South Kingston, R. I.: Sewer systems	300,000	Preliminary study made.

New England Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Thames-Blackstone-Taunton—Continued.		
Pollution—Continued.		
Norwich, Conn.: Sewage treatment plant extensions	$225,000	Preliminary plans made.
Taunton, Mass.: Sewage treatment works	950,000	Preliminary plans made and land purchased.
Tiverton, R. I.: Sewer system	100,000	Preliminary study made.
Webster, Mass.: Sewage treatment plant	600,000	Preliminary plans made.
Willimantic, Conn.: Sewage treatment plant extensions	125,000	Do.
Water supply:		
Bellingham, Blackstone Manchaug, and Millville, Mass.: Waterworks systems	345,000	Preliminary studies made.
East Lyme, Groton, and Waterford, Conn.: Extensions and improvements to water supply systems.	270,000	Preliminary plans made.
Harrisville and Pascoag, R. I.: Joint waterworks system	325,000	Plans being prepared.
North Kingston, R. I.: Waterworks construction	210,000	Preliminary study made.
Pawtucket, R. I.: Water treatment plant	400,000	Do.
Raynham, Mass.: Water supply system	45,000	Do.
Swansea, Mass.: Water supply system	290,000	Preliminary plan made.
Tiverton, R. I.: Waterworks construction	85,000	Do.
Woonsocket, R. I.: New water supply reservoir to supplement existing sources	2,180,000	Do.
Connecticut-Housatonic:		
Flood control:		
Pittsburg, N. H.: Dam and reservoir for flood control and stream regulation	1,700,000	Plans completed.
Victory, Vt.: Dam and reservoir for flood control and stream regulation	379,000	Preliminary study made.
Navigation:		
Connecticut River: Dredging 15-foot channel from mouth to Hartford, Conn	200,000	Cost given is for first 2 years. Additional needed to complete, $50,000. Authorized by Congress.
Bridgeport, Conn.: Completion of Poquonock River channel	20,000	Sum needed to complete. Authorized by Congress.
Pollution:		
Amherst, Athol, Chicopee, Dalton, East Longmeadow, Great Barrington, Greenfield, Lee, Northampton, and Westfield, Mass.: Sewer systems and/or sewage-disposal facilities.	2,000,000	Cost estimate rough and preliminary.
Amherst, Mass.: Sewer extensions, including pumping station	176,000	Preliminary plans made.
Ansonia, Derby, and Shelton, Conn.: Sewer extensions and sewage-treatment works	1,435,000	Preliminary study made.
Brattleboro and Chester, Vt.: Extensions	314,000	Cost estimate rough and preliminary.
Bridgeport, Conn.: Extensions and improvements to present sewage-treatment facilities	1,760,000	Preliminary plans made.
Bridgeport sanitary district (Bridgeport, Stratford, Trumbull, Easton, Fairfield, and Westport, Conn.): Sewage-treatment plants.	3,300,000	
Cavendish, Ludlow, and Springfield, Vt.: Sewer systems and sewage-treatment plants	200,000	Cost estimate rough and preliminary
Danbury, Conn.: Sanitary sewers, industrial waste collecting sewers and treatment	500,000	
East Hartford, Conn.: Sewage-treatment plant	125,000	
Fairfield, Conn.: Sewers and sewage treatment for Fairfield-Stratford district	267,000	
Farmington and Kensington, Conn.: Sewer systems and sewage-treatment works	200,000	Preliminary plans made.
Forestville, Conn.: Sewer system and sewage-treatment plant	185,000	
Glastonbury, Conn.: Sewage-treatment plant	267,000	
Hartland, Vt.: Drainage, sewer system, and sewage-treatment plant	40,000	
Hinsdale, Mass.: Sewer system	52,000	Do.
Meriden, Conn.: Enlargement of sewage-treatment facilities	240,000	Do.
Naugatuck, Conn.: Sewage-treatment plant	125,000	
New Haven, Conn.: Extensions and improvements to present sewage disposal facilities	1,400,000	Do.
New Milford, Conn.: Sewage treatment plant	318,000	
Plainville, Conn.: Sewers and sewage-treatment plant	425,000	
Springfield, Mass.: Sewage treatment plant	2,000,000	Cost estimate rough and preliminary.
Waterbury, Conn.: Intercepting sewers, and sewage-treatment works	1,100,000	
Winsted, Conn.: Sewage-treatment plant	285,000	
Water supply:		
Alstead, Westmoreland, and Winchester, N. H.: Water-supply systems	250,000	Do.
Amherst, Mass.: Reinforcement of water distribution system	150,000	
Completion of water system for State college and State sanitarium	46,000	
Bethel, Canaan, Meriden, and Windsor, Conn.: Extensions and improvements to water-supply systems	309,000	
Brattleboro, Vt.: Water-supply extensions	218,000	Preliminary plans made.
Cavendish, Vt.: Water-supply system for Proctorsville Village	50,000	
Colchester, East Hampton, and Plymouth, Conn.: Water-supply systems	300,000	Cost estimate rough and preliminary.
East Longmeadow, Mass.: Water-system extensions	39,000	Preliminary plans made.
Granby, Mass.: Water-system	30,000	
Hartland, Vt.: Water-supply system	35,000	
Lanesboro and Templeton, Mass.: Water-supply systems	175,000	Cost estimate is rough and preliminary
Lyndonville, Vt.: Additions and improvements to water system	30,000	
New Britain, Conn.: New water-treatment works	599,000	Preliminary plans made.
North Haverhill, N. H.: Water-supply system	49,000	Do.
North Stratford, N. H.: New water mains	24,000	Do.
North Swanzey, N. H.: Water-supply extension from Keene, N. H., system	30,000	Do.
Rochester, Sharon, and Tunbridge, Vt.: Water supply and improvements	300,000	Cost estimate rough and preliminary.
St. Johnsbury, Vt.: Filtration plant and water-supply extensions	108,000	Preliminary study made.
South Hadley, Mass.: Water-supply additions and improvements	98,000	Preliminary plans made.
West Stockbridge, Mass.: Complete new water system	93,000	Do.
Whately, Mass.: Water-supply system, including reservoir and distribution system	130,000	
GROUP B—FOR DEFERRED CONSTRUCTION		
Maine Rivers:		
Navigation:		
Hampton, N. H.: Construction of jetties and dredging of Rye Harbor	$202,000	Plans and survey made.
Pollution:		
Old Orchard, Maine: Sewage-treatment plant	100,000	Construction should await completion of study.
Water supply:		
Bangor, Maine: Waterworks improvements	235,000	Preliminary study made.
Calais, Maine: New water supply	226,000	Do.
Merrimack		
Pollution:		
Ayer, Billerica, and North Andover, Mass.: Sewer system extensions and improvements	386,000	Cost estimates rough and preliminary
Water supply:		
Ayer (Fort Devens), Billerica, Concord, Hudson, Marlboro, Maynard, and North Andover, Mass. Extensions and improvements to water-supply systems.	765,000	Do.
Eastern Massachusetts.		
Miscellaneous:		
Waltham, Mass.: Dam and sluiceway	35,000	Plans partially prepared.
Navigation:		
Boston, Chatham, Dorchester, East Boston, Fairhaven, Gloucester, Manchester, Marion, Marshfield, Nantucket, Orient Heights, Plymouth, Quincy, Revere, South Boston, Tisbury, Truro, and Winthrop, Mass. Dredging projects.	1,631,000	

New England Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Eastern Massachusetts—Continued.		
Navigation—Continued.		
Boston, Mass.: Dredging harbor along Atlantic Avenue waterfront	$155,000	Final check survey needed.
Boston, Mass.: Removal of ledge in channel to pier no. 5 of the Commonwealth of Massachusetts	100,000	Final check survey needed, preliminary plans made.
Edgartown, Mass.: Dredging channel	45,000	Surveys and plans prepared.
Saugus, Mass.: Dredging Saugus River	350,000	Survey and estimates made.
Scituate, Mass.: Dredging Scituate Harbor	350,000	Preliminary plans made.
Pollution:		
Arlington, Mass.: Relief sewer from North Metropolitan Sewerage District	290,000	Construction plans not ready.
Arlington, Cambridge, Lexington, Melrose, Reading, Revere, Somerville, and Waltham, Mass.: Extensions and improvements to sewer systems.	2,480,000	Preliminary plans made.
Boston, Mass.: Sewage-treatment works at the main outfalls into Boston Harbor	16,000,000	Investigation now under way.
Boston, Mass.: New reservoir to improve sanitary conditions in Charles River Valley	242,000	Construction plans not ready.
Boston, Mass.: Enlargement of culverts at outlet of Spot Pond and improvement of Spot Pond Brook.	160,000	Do.
Boston, Mass.: Relief sewers and pumping station for North Metropolitan District at East Boston and Deer Island	3,970,000	Do.
Boston, Mass.: Reconstruction and relief sewer for Alewife Brook section of North Metropolitan District.	705,000	Do.
Boston, Mass.: Relief sewers and appurtenant works for metropolitan area	26,000,000	To be constructed after completion of study project.
Boston, Mass.: Relief sewer for Charles River Valley	1,000,000	Construction plans not ready.
Boston, Mass.: Dredging of Mystic River to improve sanitary conditions	1,075,000	Do.
Braintree, Canton, Dedham, Milton, Needham, Norwood, Quincy, Stoughton, and Walpole, Mass.: Extensions and improvements to sewer systems.	2,661,000	Preliminary plans made.
Cambridge, Mass.: Relief sewer and additional pumps for metropolitan commission	2,427,000	Construction plans not ready.
Charlestown, Mass.: Extension to main discharge sewer system for metropolitan commission	420,000	Do.
Gloucester, Lynn, Marblehead, Salem, and Swampscott, Mass.: Extensions to sewer and storm drainage systems.	3,523,000	Preliminary plans made.
Hull, Mass.: Sewer system and sewage treatment plant	2,200,000	Construction plans not ready.
Malden, Mass.: Relief sewer for Malden River	675,000	Do.
Winchester, Mass.: Dredging upper Mystic Lake	30,000	Plans partially prepared.
Water supply:		
Bourne, Mass.: Water-supply system	66,000	Preliminary plans ready. Legislation required.
Lynn, Mass.: New reservoir to supplement present system	3,000,000	Cost estimate rough and preliminary.
Weston, Mass.: Extensions to waterworks system	100,000	Preliminary cost estimates made.
Thames-Blackstone-Taunton:		
Flood control:		
Blackstone, Millville, and Uxbridge, Blackstone River, Mass.: Channel improvement	430,000	Allotment for project made. Start of project awaiting action of towns involved.
Uxbridge, Mass.: Reconstruction of Rice City Dam	200,000	Dam weakened by March 1936 flood.
Navigation:		
New London, Conn.: Dredging a straight channel to State pier	16,000	Surveys completed.
Pollution:		
Abington, Easton, Mansfield, and Whitman, Mass.: Sewer systems and sewage treatment plants for village centers.	1,500,000	Further study needed.
Coventry, Johnston, Warwick, and West Warwick, R. I.: Initial construction of sewers and sewage-treatment plants.	1,500,000	Cost estimate rough and preliminary.
Water supply:		
Newport, R. I.: Additional water supply	500,000	Further study needed.
Seekonk, Mass.: Water-supply system	100,000	Do.
Connecticut-Housatonic:		
Drainage:		
Longmeadow, Mass.: Drainage channel to Connecticut River—cleaning and extending	60,000	
Erosion:		
Brattleboro, Vt.: Flood wall to protect industrial property	213,000	Preliminary plans made.
Connecticut River: Riprap for protection of banks at Agawam, Hadley, Hatfield, Holyoke, Montague, Northampton, Northfield, Sunderland, and Whately, Mass.	290,000	Do.
Hartford, Vt.: Protection of banks of White River against erosion	45,000	
Flood control:		
Ashburnham, Mass.; Cavendish Township, Vt.; Claremont, N. H.; East Haven and Gayesville, Vt.; Grantham, N. H.; Groton, Vt.; Huntington and Hydeville, Mass.; Londonderry, Ludlow, Lyndonville, Newfane, North Landgrove, North Springfield, and Randolph Township, Vt.; Royalston and Winchendon, Mass.; South Corinth, South Randolph, South Tunbridge, and Thetford Township, Vt.; and West Canaan, N. H.: Reservoirs for flood control and river regulation.	25,328,000	Preliminary study made. Sites not acquired and legislation needed.
Pollution:		
Bethlehem, N. H.: Sewer system extensions	100,000	
St. Johnsbury, Vt.: Storm sewers	33,000	
Water supply:		
Pittsfield, Mass.: Water main extensions	75,000	


NORTH ATLANTIC
SCALE OF MILES
LAKE ONTARIO
ROCHESTER
NIAGARA FALLS
BUFFALO
SYRACUSE
Mohawk River
MANCHESTER
VERMONT
NEW HAMPSHIRE
Connecticut River
ALBANY
NEW YORK
HUDSON
Genesee River
Susquehanna River
Delaware River
Hudson River
SPRINGFIELD
MASSACHUSETTS
CONNECTICUT
HARTFORD
NEW YORK
PENNSYLVANIA
Poughkeepsie
Housatonic
NEW HAVEN
SCRANTON
WILKES-BARRE
NEW JERSEY
LONG ISLAND SOUND
SUSQUEHANNA
NEW YORK
YORK COAST
NEW JERSEY
DELAWARE
HARRISBURG
READING
WILMINGTON
TRENTON
PHILADELPHIA
CAMDEN
Susquehanna River
PENNSYLVANIA
MARYLAND
Potomac River
WEST VIRGINIA
Salem
ATLANTIC CITY
BALTIMORE
DELAWARE BAY
OCEAN
Cape May
Cape Henlopen
ATLANTIC
DELAWARE
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Study Project
Basin Wide Study, Water Supply
Basin Wide Study, Pollution
Construction Project, Flood Control Headwaters Susquehanna, Delaware Rivers and Finger Lakes
Construction Project
Projects shown include only those ready for immediate construction.
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

The North Atlantic drainage basins comprise the Hudson, Delaware, and Susquehanna River systems, and the contiguous coastal plain from Bridgeport, Conn., to Indian River, Del. About one-sixth of the entire Nation lives in this district. About two-thirds of this population, in turn, live in two metropolitan areas—New York and Philadelphia. The scope and urgency of the principal water problems, those of water supply and pollution, result from the size and nature of these great urban concentrations.

New York City and its urban satellites, particularly the municipalities in northern New Jersey, face immediate expenditures on new and additional water supplies that will exceed $300,000,000. Philadelphia and its neighboring communities will soon take steps in the same direction. The additional water supplies for both groups of cities will come from the Delaware River system, a fact that indicates the wisdom of rating the provision of public water supplies as the highest use of the Delaware River tributaries. The experience of these cities should serve as a warning, it may be noted, to other cities and groups of cities to look years ahead and provide themselves with potential water supplies to care for future needs. For this purpose, comprehensive investigations of both underground and surface water resources are essential. For the purpose of utilizing these resources when need arises, plans should be formulated now for cooperation through interconnection of systems and the formation of metropolitan water districts.

Hardly second to water-supply requirements in these metropolitan areas is the intolerable situation caused by excessive pollution of their surface waters. An Interstate Sanitation Commission has been formed to promulgate standards and find solutions for the pollution problems of the coastal area centering in New York City. Here about $100,000,000 must be spent to protect health, shipping, recreation, and shellfish. The recently formed Interstate Commission on the Delaware has adopted pollution abatement as its first objective. This involves sewage treatment at Philadelphia, both for the city itself and for surrounding communities in Pennsylvania and New Jersey.

Abatement of industrial pollution is progressing slowly through cooperative action of the industries with State and Federal agencies. Pollution from mines particularly concerns this district because the anthracite coal fields lie entirely in the Delaware and Susquehanna basins. Culm waste and acid mine waters afford a field for research that may provide beneficial byproducts.

The great metropolitan areas are not the only offenders with respect to pollution. Many other cities and towns are allowing untreated sewage to enter streams of the district, while still others have most inadequate and unsanitary facilities. At many places, untreated sewage enters streams used at lower points for water supply, bathing, and fishing. While these communities with few exceptions acknowledge a moral obligation to treat and purify their sewage, most of them are unable to raise the funds for treatment works or are disinclined to spend money for such a purpose.

Because of the great urban power market, hydroelectric installations have been made on various streams of the district, usually in conjunction with systems supplied largely by steam-electric power plants. Further development of power on these streams apparently can be made practicable by combining it with other objectives. Large-scale storage with draw-down facilities not only could supplement the firm power of the streams during dry-weather flow, but also would benefit navigation and help to repel salinity invasion (critical on the Delaware), to dilute the effluents from sewage and industrial waste-treatment plants, and to preserve fish life. The lakes formed by such reservoirs would be capable of development for recreational purposes, and manipulation of the structures to conserve water would make them a valuable adjunct in flood abatement. Federal funds already have been made available for flood-abatement studies in those parts of the Susquehanna and Delaware drainage areas which lie in southern New York and northern Pennsylvania. Similar studies should be made in other parts of the district, with due regard to the possibilities of multiservice reservoirs.

The destructive action of water in the district is not restricted to the ravages of occasional floods. Almost every resort city on the coast of New Jersey now has projects for jetties and bulkheads to prevent beach erosion and protect property against the ceaseless action of waves and currents. These municipalities will be aided in this work by the Federal Beach Erosion Board. Deposition of material from anthracite mines in the channels of the port of Philadelphia and in the Schuylkill River above Fairmont Dam also requires immediate study.

The ports of New York and Philadelphia rank first and second in tonnage in the country. As in the past, concentration of commerce at these ports makes the improvement of their commercial waterways and harbors a matter of almost constant concern.

North Atlantic Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Hudson:		
Miscellaneous:		
Lower Hudson River Basin, New York and New Jersey: Study for coordinated development of water resources, including water supply, flood control, pollution abatement, water power, and recreation.	$100,000	
Mohawk River Basin, N. Y.: Study for development of water resources including flood protection, erosion control, and multiservice reservoirs.	25,000	
Upper Hudson River Basin including Hoosic River in New York, Massachusetts, and Vermont: Study for development of water resources, including flood protection, erosion control, and multiservice reservoirs.	25,000	
New Jersey-New York Coast:		
Pollution:		
Hudson County, N. J.: Study of intercepting sewers and sewage treatment problems	50,000	
Water supply:		
Study of interconnections to existing water-supply systems in northern New Jersey metropolitan district to provide for proper distribution of available supplies and to devise method of administrative control.	75,000	
Delaware:		
Water supply:		
Northeastern New Jersey municipalities: Study of future water supply, including consideration of proposed Tock's Island Reservoir and other sources.	40,000	Preliminary study made.
Philadelphia, Pa.: Study of future water supply, including consideration of proposed Tock's Island Reservoir and other sources.	60,000	Do.
Susquehanna:		
Pollution:		
Study to determine methods of eliminating mine wastes from the Susquehanna and Delaware Rivers and tributaries, thereby removing existing pollution.	25,000	
Water supply:		
Study to determine the future water supply needs for all municipalities over 25,000 population throughout the basin including advisability of creating a metropolitan water-supply project for Harrisburg, Pa., and vicinity.	75,000	
2. Construction Projects		
Hudson:		
Flood control:		
North Adams, Mass.: Clearing of channel and construction of drift barriers in the Hoosic River above the city for flood control.	66,000	Plans not ready. Authorized by Congress.
Navigation:		
Great Lakes to Hudson River Waterway, N. Y.: Deepening and widening New York State Barge Canal from the Hudson River to Oswego on Lake Ontario.	15,000,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $2,165,000. Authorized by Congress.
Rondout, N. Y.: Deepening navigation channel in harbor	15,000	Survey completed. Authorized by Congress.
Pollution:		
Adams, Mass.: Sewage treatment plant and trunk sewer extension	155,000	Preliminary plans completed.
Beacon, N. Y.: Sewage treatment plant	150,000	Plans completed.
Chatham, N. Y.: Sewage treatment plant	178,000	Do.
Cohoes, N. Y.: Sewage treatment plant	500,000	Do.
Fort Edward, N. Y.: Sewage treatment plant	77,000	Do.
Greenburgh, N. Y.: Sewage treatment plant	230,000	Do.
Hudson, N. Y.: Sewage treatment plant	250,000	Do.
Menands, N. Y.: Sewage treatment plant	35,000	Do.
Middletown, N. Y.: Sewage treatment (secondary) plant	210,000	Do.
Mohawk, N. Y.: Sewage treatment plant	27,000	Do.
Pleasantville, N. Y.: Sewage treatment plant	70,000	Do
Schenectady, N. Y.: Improvement to sewage treatment plant	170,000	Do.
Scotia, N. Y.: Sewage treatment plant	95,000	Do.
Troy, N. Y.: Sewage treatment plant	1,500,000	Do.
Utica, N. Y.: Sewage treatment plant	1,150,000	Do.
West Point, N. Y.: Sewage treatment plant	49,000	Do.
Williamstown, Mass.: Trunk sewer and sewage treatment plant	100,000	Rough estimate.
Whitesboro, N. Y.: Sewage treatment plant	169,000	Plans completed.
Water supply:		
Adams, Mass.: Reservoir for fire district	200,000	Do.
Glens Falls, N. Y.: Water treatment plant	175,000	
Indian Lake, N. Y.: Water supply system	60,000	
Schenectady, N. Y.: Additional water supply	200,000	Do.
New Jersey-New York Coast:		
Drainage:		
Hudson County, N. J.: Drainage of 90,000 acres of marshland for mosquito extermination	169,000	Survey being made.
Erosion (coastal):		
Avon, N. J.: Beach erosion control by jetties and bulkheads	82,000	Preliminary plans completed.
Belmar, N. J.: Beach erosion control by jetties and bulkheads	105,000	Preliminary plans prepared.
Bradley Beach, N. J.: Beach erosion control by jetties and bulkheads	160,000	Plans prepared.
Deal, N. J.: Beach erosion control by jetties and bulkheads	320,000	Do.
Long Branch, N. J.: Beach erosion control by jetties and bulkheads	570,000	Survey and preliminary plans completed.
Flood control:		
Clifton, N. J.: Improvement of Weasel Brook channel for flood protection	205,000	Plans completed.
Middlesex, Somerset, and Union Counties, N. J.: Channel improvements of Green and Stony Brooks for flood control.	350,000	
Paterson, N. J.: Channel improvements on Passaic River from Great Falls to Newark Bay	6,000,000	Including cost of study of storage reservoir and mosquito elimination between Great Falls and Little Falls.
Navigation:		
Barnegat Inlet, N. J.: Dredging navigation channel	533,000	Authorized by Congress.
Mamaroneck, N. Y.: Dredging navigation anchorage in west basin of harbor	53,000	Do.
New York, N. Y.: Dredging of Bay Ridge and Red Hook Channels	120,000	Sum needed to complete. Authorized by Congress.
New York, N. Y.: Dredging of anchorage at Red Hook Flats	2,431,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $624,000. Authorized by Congress.
New York, N. Y.: Deepening of Buttermilk Channel	783,000	Survey completed.
New York, N. Y.: Channel deepening of New York-New Jersey channels, from point near Sandy Hook, through Gedney and Bayside Channels, Lower New York Bay, Raritan Bay, and Staten Island Sound to Upper New York Bay.	10,000,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $12,119,000. Authorized by Congress.
New York, N. Y.: Widening channel of Hudson River	257,000	Sum needed to complete. Authorized by Congress.
New York, N. Y.: Straightening channel of Harlem River	200,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $300,000. Authorized by Congress.
Port Chester, N. Y.: Remove isolated rock shoals	12,000	Survey completed. Authorized by Congress.

North Atlantic Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction projects—Continued		
New Jersey-New York Coast—Continued.		
Pollution:		
Darien, Rowayton, and Westport, Conn.: Sewage treatment plants	$625,000	Projects proposed.
Flemington, Hawthorne, Sea Girt, Sea Isle City, and Westwood, N. J.: Sewer system and/or sewage treatment plants.	184,000	
Fort Lee, N. J.: Replacement of combined sewer outfall to Hudson River	100,000	Plans completed.
Hempstead, N. Y.: Sewer system	684,000	Preliminary plans prepared.
Middlesex, N. J.: Sewer system and sewage treatment plant	551,000	
New York, N. Y.: Sewage treatment plant at Tallmans Island	7,155,000	Plans completed.
New York, N. Y.: Sewage treatment plant at Jamaica Bay	3,888,000	Plans being prepared.
New York, N. Y.: Sewage treatment plants	74,310,000	Preliminary plans made. To complete 10-year program.
Ocean Township, N. J.: Sewer system and sewage treatment (partial) plant	100,000	Plans prepared.
Raritan, N. J.: Interceptor sewers and sewage treatment plant	264,000	Do.
Somerville, N. J.: Interceptor sewers and sewage treatment plant	211,000	Do.
South Plainfield, N. J.: Sewer system and sewage treatment plant	387,000	Plans completed.
Union Beach, N. J.: Sewer system and sewage treatment (partial) plant	396,000	Plans prepared.
Valley Stream, N. Y.: Sewage treatment plant	1,758,000	
Watchung, N. J.: Extension of sewer system	111,000	Plans completed.
West Cape May, N. J.: Sewer system	51,000	Plans prepared.
Woodbridge, N. J.: Intercepting sewers and sewage treatment plant	186,000	Do.
Water supply:		
Bunnvale or Chimney Rock, N. J.: Dam, aqueducts, aerators, filtration plant, and distribution systems for water supply to northeastern New Jersey communities	47,000,000	Preliminary studies completed.
Bayville, N. Y.; Chester and Long Branch, N. J.; and Northport, N. Y.: Water supply systems	189,000	Plans completed.
Centre Island, N. Y.: Waterworks system	56,000	Preliminary plans prepared.
Harrison and Mamaroneck, N. Y.: Water supply improvements	419,000	Do.
Jersey City, N. J.: Rehabilitation of 72-inch water main	651,000	Sketch plans in preparation.
Lincoln Park, N. J.: Waterworks system	241,000	Plans prepared.
Parsippany and Troy Hills, N. J.: New water supply	73,000	Plans completed.
Rocky Hill, N. J.: Waterworks system	65,000	Do.
Wanaque, N. J.: New water supply	18,000	Do.
Delaware:		
Flood control:		
Retarding dams in headwaters of Susquehanna and Delaware Rivers and Finger Lakes region for flood control.	See remarks.	Estimated cost of reservoirs in Delaware Basin included in Susquehanna Basin project.
Navigation:		
Big Timber Creek, N. J.: Dredging channel 10 feet deep and 60 feet wide	38,000	Survey complete. Authorized by Congress.
Chesapeake and Delaware Canal: Dredging channel to a depth of 27 feet	5,393,000	Sum needed to complete. Authorized by Congress.
Mantua Creek, N. J.: Dredging channel 10 to 12 feet deep, 60 to 100 feet wide	25,000	Do.
Maurice River, N. J.: Dredge channel 8 feet deep and 150 feet wide	65,000	Cost to complete. Authorized by Congress.
Pollution:		
Abington Township, Pa.: Sewer system, pumping stations, and complete sewage treatment plant	1,400,000	Plans completed.
Birdsboro, Pa.: Sewer system and first stage sewage treatment plant	300,000	Preliminary plans made.
Brooklawn, N. J.: Reconstruction of sewage treatment plant	36,000	Survey being made.
Camden, N. J.: 2 first stage sewage treatment plants	3,000,000	Preliminary plans and estimates made.
Chester, Pa.: First stage sewage treatment plant	600,000	Do.
Delaware and Montgomery Counties, Pa.: District sewer system and sewage treatment plants to serve 27 communities.	6,000,000	Plans completed.
Florence, N. J.: Sewer system and sewage treatment plant	140,000	Do.
Haddon Township, N. J.: Sewage treatment plant	48,000	Sketch plans in preparation.
Hatfield, Pa.: Sewer system and sewage treatment plant	150,000	Preliminary plans made.
Haverford and Radnor Townships, Pa.: Sewage treatment plant for complete treatment	328,000	Plans completed.
Lambertville, N. J.: Sewage treatment plant	229,000	Do.
Lansdale, Pa.: Sewer construction	100,000	Comprehensive plan made.
Philadelphia, Pa.: Sewer system; interceptors and 2 first stage sewage treatment plants and extension of existing plant.	25,000,000	Preliminary plans and estimates made.
Port Jervis, N. Y.: Sewage treatment plant for complete treatment	300,000	Preliminary plans made.
Rose Valley, Pa.: Sewage treatment plant	37,000	Plans completed.
Souderton, Pa.: Sewer system and sewage pumping station	150,000	Do.
Water supply:		
Alpha, N. J.: Water supply system	60,000	Do.
Andover, N. J.: Water supply system	45,000	Sketch plans prepared.
Bordentown, N. J.: Water supply collecting system	26,000	Plans in preparation.
Camden, N. J.: Wells and water mains	810,000	Plans completed.
Clementon, N. J.: Extension and repairs to waterworks system	42,000	Do.
Gloucester, N. J.: Wells and water mains	55,000	Do
New York, N. Y.: Additional water supply; reservoirs on Neversink River, East Branch of Delaware and Rondout Creek (Hudson Basin) with interconnecting aqueducts and appurtenant structures.	272,587,000	Plans completed. Of the estimated cost, $17,500,000 has been appropriated by New York City, construction to extend over 8 to 10 years.
Philadelphia, Pa.: Water supply improvements in existing filter plants, pumping stations and distribution system, including installation of pumping mains.	3,130,000	Plans completed.
Pine Hill, N. J.: Water supply system	150,000	Plans prepared.
Susquehanna:		
Flood control:		
Retarding dams in headwaters of Susquehanna and Delaware Rivers and Finger Lakes region for flood control.	31,516,000	Cost to complete as authorized by Congress. Plans being prepared. Includes estimated cost of land, $5,930,000.
Kingston and Edwardsville, Pa.: Levees on North Branch of Susquehanna River for flood protection.	226,000	Authorized by Congress.
Sunbury, Pa.: Levee on Susquehanna River for flood protection	109,000	Authorized by Congress. Plans being prepared.
Wilkes-Barre and Hanover Township, Luzerne County, Pa.: Levees on North Branch of Susquehanna River for flood protection.	281,000	Authorized by Congress.
Pollution:		
Altoona, Pa.: Sewage treatment plant	1,250,000	
Bedford, Pa.: Sewer system and sewage treatment plant	170,000	Plans completed.
Binghamton, Endicott, and Johnson City, N. Y.: Sewage treatment plants	1,600,000	
Borough of State College, Pa.: Sewage treatment plant	121,000	Do.
Clarks Summit, Pa.: Sewer system and sewage treatment plant	391,000	Do.
Elmira, N. Y.: Intercepting sewers and sewage treatment plant	900,000	

North Atlantic Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION		
Hudson:		
Flood control:		
Chain Lakes, Hamilton County, N. Y.: Dam and reservoir on Cedar River for flood and low-flow control.	$1,600,000	Preliminary plans completed.
Washington County, N. Y.: Shushan Dam and Reservoir on Batten Kill for flood and low-flow control.	1,397,000	Do.
Pollution:		
Amsterdam, N. Y.: Sewage treatment plant	700,000	
Athens, Castleton, Catskill, Coxsackie, Coldspring, Dobbs Ferry, Ellenville, Fishkill, Monroe, New Paltz, Valatie, N. Y.: Sewage treatment plants.	785,000	
Bennington, Vt.; Fonda, Fort Plain, Green Island, Greenwich, Hoosick Falls, Salem, Schuylerville, St. Johnsville, and Waterford, N. Y.: Sewage treatment plants.	473,000	
Cambridge, N. Y.: Sewage treatment plant	105,000	
Glens Falls, N. Y.: Sewage treatment plant	277,000	
Haverstraw, N. Y.: Sewage treatment plant	110,000	
Highland Falls, N. Y.: Sewage treatment plant	232,000	
Hudson Falls, N. Y.: Sewage treatment plant	130,000	
Ilion, N. Y.: Sewage treatment plant	198,000	Plans not completed.
Kingston, N. Y.: Sewage treatment plant	560,000	
Mechanicville, N. Y.: Sewage treatment plant	167,000	
Newburgh, N. Y.: Sewage treatment plant	470,000	
Northville, N. Y.: Sewage treatment plant	82,000	
Peekskill, N. Y.: Sewage treatment plant	340,000	
Poughkeepsie, N. Y.: Sewage treatment plant	800,000	
Rensselaer, N. Y.: Sewage treatment plant	224,000	
Rhinebeck, N. Y.: Sewage treatment plant	105,000	
Stillwater, N. Y.: Sewage treatment plant	120,000	
Warwick, N. Y.: Sewage treatment plant	147,000	
Watervliet, N. Y.: Sewage treatment plant	320,000	
Water supply:		
Amsterdam, N. Y.: Water treatment plant	237,000	
Clayville, N. Y.: Additional water supply	80,000	
West Point, N. Y.: Military Academy water supply	100,000	
New Jersey-New York Coast:		
Drainage:		
Bergen County, N. J.: Cleaning and regrading brooks to improve drainage for mosquito elimination	302,000	Survey started.
Navigation:		
Atlantic, Cape May, and Ocean Counties, N. J.: Redredging of inland waterways for navigation	52,000	Surveys completed.
Middlesex and Monmouth Counties, N. J.: Dredging channel of Shrewsbury River and construction of yacht basin in Raritan Bay.	80,000	Survey completed.
Perth Amboy, N. J.: Dredging navigation channel in Raritan River	267,000	Do.
Point Pleasant, N. J.: Protective bulkheads for navigation	100,000	Do.
Pollution:		
Long Branch, N. J.: Intercepting sewer, pumping station and force main	266,000	
Sloatsburg, N. Y.: Sewage treatment plant	98,000	
Water supply:		
Butler, N. J.: Dam for water supply	246,000	Sketch plans in preparation.
Ocean Beach, N. Y.: Improvements to water supply	130,000	
Miscellaneous:		
Rockaway Township, N. J.: Dam for third naval district, Lake Denmark	40,000	Do.
Delaware:		
Flood control:		
Philadelphia, Pa.: Raise height of seawall and erect protective fence at Frankford Arsenal	100,000	Plans being prepared.
Navigation:		
Delanco, N. J.: Excavation of a cross channel off Delanco, N. J., 200 feet wide and 8 feet deep	32,000	Surveys completed.
Dennis Creek, N. J.: Dredging channel from deep water in Delaware River to Dennis Creek	110,000	Survey completed.
Gloucester and Salem Counties, N. J.: Dredging channels from deep water in Delaware River into creeks.	85,000	Do.
Harbor of Refuge, Delaware Bay: Dredge channel 15 feet deep and 300 feet wide	65,000	Surveys completed. Authorized by Congress.
Mispillion River, Del.: Extension of north jetty at mouth of river for approximately 3,500 feet	90,000	Survey completed.
Pollution:		
Conshohocken, Pa.: Sewer system and first-stage sewage treatment plant	804,000	Preliminary plans made.
Delhi, N. Y.: Sewage treatment plant	100,000	
Fleischmans, N. Y.: Sewage treatment plant	300,000	
Gloucester, N. J.: Sewer system and first-stage sewage treatment plant	300,000	Plans complete for system only.
Hancock, N. Y.: Sewage treatment plant	86,000	
Morrisville, Pa.: Sewer system and first-stage sewage treatment plant	375,000	
Paulsboro, N. J.: Sewage treatment plant	76,000	Plans completed.
Phoenixville, Pa.: Sewer system and first-stage sewage treatment plant	750,000	Plans being prepared.
Spring City, Pa.: Sewer system and sewage treatment plant	205,000	Investigation made.
Walton, N. Y.: Sewage treatment plant	210,000	
Susquehanna:		
Flood control:		
Bloomsburg, Forty Fort, Jersey Shore, Lock Haven, Milton, Montgomery, Muncy, Nanticoke, Plymouth, Swoyersville, and West Pittston, Pa.: Levees for flood control.	5,891,000	Plans being prepared. Authorized by Congress.
Harrisburg, Pa.: Levees on Susquehanna River for flood protection	109,000	Plans prepared. Authorized by Congress.
Williamsport, Pa.: Levees on West Branch of Susquehanna River for flood protection	2,600,000	Do.
York, Pa.: Retarding dams on Codorus Creek	2,600,000	Do.
Pollution:		
Canton, Pa.: Sewage treatment plant	50,000	
Cardiff, Md.: Sewer system and sewage treatment plant	25,000	
Cherry Valley, N. Y.: Sewage treatment plant	50,000	
Cortland, N. Y.: Sewage treatment plant	314,000	
Harrisburg, Pa.: Sewage treatment plant	1,200,000	
Huntingdon, Pa.: Sewage treatment plant	150,000	
Mount Union, Pa.: Sewage treatment plant	120,000	
Nanticoke, Pa.: Sewage treatment plant	400,000	
Sayre, Pa.: Sewage treatment plant	160,000	
Spring Garden Township, York County, Pa.: Sewer system	795,000	
Tyrone, Pa.: Sewage treatment plant	180,000	
Wilkes Barre, Pa.: Sewage treatment plant	1,300,000	
Williamsport, Pa.: Sewage treatment plant	700,000	
York, Pa.: Improvements to sewage treatment plant	150,000	
Water supply:		
Greenwood, Pa.: Reservoir and water supply system	136,000	
Lebanon, Pa.: Water filtration plant	250,000	

Water-supply and sewage-disposal improvements constitute the chief immediate steps in water-conservation programs for the basins of the rivers flowing into the Atlantic between the Potomac River at the north and the Edisto River at the south. The boundary between Piedmont Plateau and Coastal Plain divides these drainage areas into two provinces from the standpoint of water problems. Hydroelectric-power generation and erosion control are outstanding problems on the Piedmont. On the Coastal Plain, prospective programs relate in large measure to drainage for malaria control and to local navigation improvements. In both provinces projects bearing on municipal sanitation overshadow other specific undertakings in number and present importance.

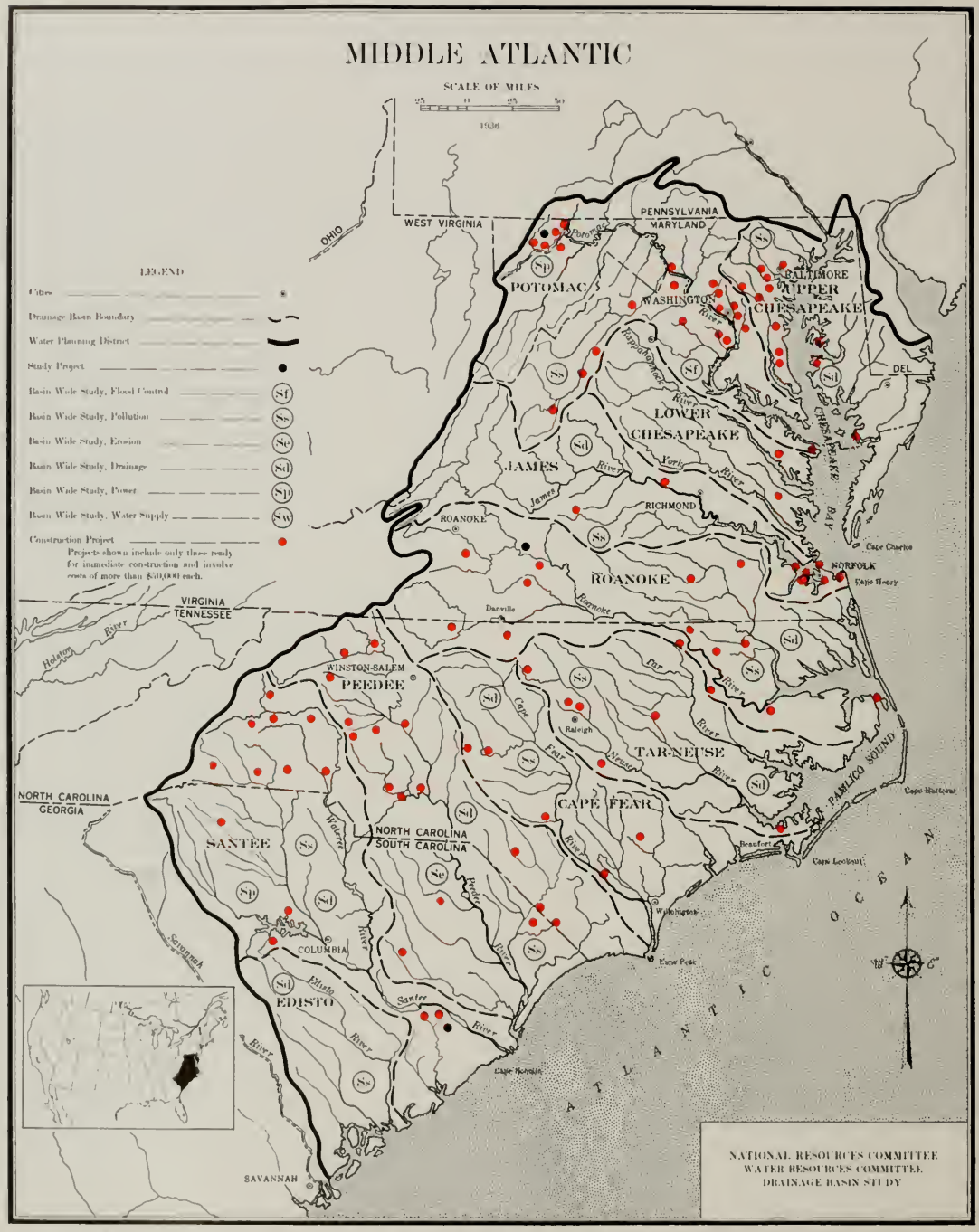
The outstanding current need of the district is for sewage-treatment plants at small and medium-sized communities. In most basins there are towns which lack public water supplies, sewers, or sewage-disposal facilities. A few of the large urban areas—notably Cumberland and the suburban areas of Washington and Baltimore—require extensions of present water-supply systems. Many cotton milling and other manufactural towns of the Piedmont have grown rapidly and have not made provision for sanitary disposal of domestic and industrial waste. During periods of low water flow some of the streams in that section are heavily polluted. Stream pollution is less serious on the Coastal Plain because of small urban population, less irregular stream flow, and greater utilization of underground waters for municipal supplies. At Beaufort, S. C., however, and at Hampton Roads, Va., pollution has assumed proportions which have necessitated restrictions on shellfishing. A number of treatment plants to correct, in part, these unsanitary conditions are recommended in the accompanying project list. Initiation of pollution-control projects in the deferred priorities should, if practicable, await completion of basin-wide pollution surveys for the entire district. Essential data on sources of pollution, degree of waste dilution, stream flow, and the economic effects of pollution are now lacking. Surveys of this type should be undertaken promptly and should be supplemented later by investigations to determine the quality and availability of underground and surface waters from the standpoint of possible use by municipalities.

Although the streams of the Piedmont in the Carolinas have been utilized extensively for hydroelectric power, large undeveloped power resources remain in the Carolinas, the Virginia and Maryland section of the Piedmont, and the Shenandoah Valley. Additional installations of 300,000 kilowatts on the upper Santee River, 235,000 kilowatts on the Yadkin-Peedee system, and 1,030,000 kilowatts on the Potomac River have been investigated, together with possible installations on the Roanoke, Meherrin, James, and minor streams. Doubt has been cast on the feasibility of these programs because the possible market for the power to be generated may be absorbed by other projects under construction or proposed. Heretofore, the programs have been studied intensively only from the standpoint of individual drainage basins. All possible power developments in the Middle Atlantic district and contiguous areas should be examined in relation one to another, and in relation also to competing steam-plant generation and to prospective markets for power. A comprehensive survey of this nature should precede construction of new power plants, and is recommended. No recommendation is included in this report concerning the Santee-Cooper Power and Navigation Project since that proposal has already been approved by the President and is now in litigation.

The soils of the Piedmont generally are susceptible to heavy erosion under improper cropping practices. The resultant soil losses injure agriculture, and contribute in unknown degree to reservoir silting, to the turbidity of streams, and to clogging of small stream channels. Quantitative investigations of these relationships between soil erosion and water utilization are needed.

Malaria control through drainage is an outstanding public-health problem in the Carolina and Virginia portions of the Coastal Plain and in scattered parts of the Piedmont where heavy silting of stream channels has occurred. County-wide drainage projects planned by the respective State boards of health are recommended for early execution. Projects in other counties where malaria causes heavy losses should be drawn up following further studies which would give due attention to the restoration or abandonment of old drainage systems.

In general, the navigation facilities of the district are as well developed as warranted by transportation requirements. Small-scale channel improvements have been authorized by the Congress in a number of tidal estuaries along the coast, chief of which are the Potomac and the James.


MIDDLE ATLANTIC
SCALE OF MILES
1936
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Study Project
Basin Wide Study, Flood Control
Basin Wide Study, Pollution
Basin Wide Study, Erosion
Basin Wide Study, Drainage
Basin Wide Study, Power
Basin Wide Study, Water Supply
Construction Project
Projects shown include only those ready for immediate construction and involve costs of more than $50,000 each.
OHIO
WEST VIRGINIA
PENNSYLVANIA
MARYLAND
POTOMAC
WASHINGTON
BALTIMORE
UPPER CHESAPEAKE
DEL
LOWER CHESAPEAKE
JAMES
RICHMOND
ROANOKE
NORFOLK
Cape Charles
Cape Henry
VIRGINIA
TENNESSEE
Danville
WINSTON-SALEM
PEEDEE
Raleigh
TAR-NEUSE
PAMLICO SOUND
Cape Hatteras
NORTH CAROLINA
GEORGIA
CAPE FEAR
NORTH CAROLINA
SOUTH CAROLINA
SANTEE
Beaufort
Cape Lookout
Wilmington
COLUMBIA
Cape Fear
EDISTO
Cape Romain
SAVANNAH
ATLANTIC OCEAN
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

Middle Atlantic Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Upper Chesapeake:		
Drainage:		
Comprehensive study of drainage problems in the basin	$5,000	Cooperative investigation by State and Federal agencies.
Pollution:		
Comprehensive study of stream pollution problems in the basin	50,000	For protection of oyster beds.
Potomac:		
Drainage:		
Comprehensive study of drainage problems in the basin	8,000	Cooperative investigation by State and Federal agencies.
Pollution:		
Preparation of basin-wide program for pollution control in conjunction with flood control, navigation, and power development.	300,000	Recommended in report of advisory committee on water pollution, and endorsed by State departments of health.
Water supply:		
Georges Creek Valley, Md.: Development of metropolitan district for water and sewerage	10,000	Preliminary plans made.
James:		
Drainage:		
Comprehensive study of drainage problems in the basin	5,000	Cooperative investigation by State and Federal agencies.
Pollution:		
Comprehensive study of stream pollution problems in the basin	10,000	
Roanoke:		
Drainage:		
Comprehensive study of drainage problems in the basin	14,000	Do.
Pollution:		
Comprehensive study of stream pollution by municipal and industrial wastes in the basin	15,000	
Tar-Neuse:		
Drainage:		
Comprehensive study of drainage problems, both for land use and mosquito control	6,000	Do.
Pollution:		
Comprehensive study of stream pollution by municipal and industrial wastes	8,000	
Cape Fear:		
Drainage:		
Comprehensive study of drainage problems in the basin	4,000	Do.
Pollution:		
Comprehensive study of stream pollution caused by municipal and industrial wastes	5,000	Do.
Peedee:		
Drainage:		
Comprehensive study of drainage problems in the basin	12,000	Do.
Pollution:		
Comprehensive study of stream pollution by municipal and industrial wastes and soil erosion in the basin.	18,000	Do.
Santee:		
Drainage:		
Comprehensive study of drainage problems in the basin	16,000	Do.
Pollution:		
Comprehensive study of stream pollution by municipal and industrial wastes in the basin	32,000	Do.
Edisto:		
Drainage:		
Basin-wide study of potential drainage, both for land use and mosquito control	5,000	
Pollution:		
Basin-wide study of stream pollution	5,000	Do.
2. Construction Projects		
Upper Chesapeake:		
Drainage:		
Baltimore, Md.: Lafayetta Avenue storm drain	623,000	Plans completed.
Navigation:		
Annapolis, Md.: Dredging channel 15 feet deep, 100 feet wide, in Severn River and Anchorage Basin in Opa Creek.	24,000	Survey completed.
Pollution:		
Baltimore, Md.: Jones Fall intercepting sewer	2,024,000	Plans completed.
Baltimore, Md.: Boston Street and Bayliss Street sewers and sewage disposal for Camp Holabird	241,000	Do.
Baltimore County metropolitan district, Md.: Sewer system extensions	750,000	Preliminary plans made.
Baltimore County, Md.: Montrose School for Girls: Sewer system extensions	4,000	Plans completed.
Betterton, Chesapeake City, Church Hill, East New Market, Elkridge, Ellicott City, Hampstead, Manchester, Mardela Springs, Hillsboro, North East, Oxford, Princess Anne, Public Landing, Queen Anne, Queenstown, Rock Hall, Round Bay and Severna Park, St. Michaels, and Secretary, Md.: Sewer systems and sewage treatment plants.	821,000	
Brooklyn Park, Md.: Sewer system	125,000	Do.
Cambridge, Md.: Sewage treatment plant	105,000	Do.
Cambridge, Md.: Sewage treatment plant for Eastern Shore State Hospital	30,000	
Chesapeake Beach and North Beach, Md.: Sewer system and sewage treatment plant	150,000	No plans have been made.
Chestertown, Federalsburg, and Springfield State Hospital, Md.: Sewer system extension	165,000	Plans completed for Federalsburg and Chestertown only.
Crisfield, Md.: Sewer system extensions and sewage treatment plant additions	120,000	
Crownsville, Md.: Relief outfall sewer	12,000	Plans completed.
Easton, Md.: Sewage treatment plant	125,000	Preliminary plans made.
Henryton Tuberculosis Sanitorium, Maryland Training School for Colored Girls, and Rosewood, Md.: Sewage treatment plant additions.	50,000	
Maryland House of Correction, Maryland Training School for Boys, and Ridgely, Md.: Sewage treatment plants.	122,000	
Ocean City, Md.: Sewer system extensions and sewage treatment plant additions	250,000	Partial plans made.
West Annapolis, Md.: Sewer system	57,000	Plans completed.

Middle Atlantic Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Upper Chesapeake—Continued.		
Water supply.		
Betterton, Charlotte Hall, Chestertown, and Edgewood Arsenal, Md.: Water supply extensions	$95,000	
Bowie, Cecilton, Church Hill, Chesapeake City, Galena, Goldsboro, Hebron, Hillsboro, Mardela Springs, Marion, Millington, North East, Prince Frederick, Queen Anne, Round Bay and Severna Park, Solomons, Stillpond, Sudlersville, Sykesville, and Upper Marlboro, Md.: Water supply systems	571,000	
Chesapeake Beach and North Beach, Md.: Water supply systems	100,000	No plans have been made
Crownsville and Ellicott City, Md.: Water supply extensions and filtration	115,000	
Washington Suburban Sanitary District, Md.: Water supply development from Patuxent River	275,000	Plans completed.
Potomac:		
Flood control:		
Cumberland, Md.: Levees and diversion for flood protection	887,000	Authorized by Congress.
Harpers Ferry, W. Va.: Levees and walls	169,000	Do.
Moorefield, W. Va.: Levees and walls	47,000	Do.
Washington, D. C.: Levees and grade raising for flood protection	587,000	Do.
Navigation:		
Washington, D. C.: Deepening harbor channels to 24 feet	173,000	Do.
Washington, D. C.: Potomac River waterfront	1,650,000	Survey completed. Authorized by Congress
Westmoreland, Va.: Nomini Creek. Dredging channel	10,000	Authorized by Congress.
Pollution:		
Alexandria, Va.: Construction of sewers and partial treatment plant	250,000	Preliminary report made.
Cumberland, Md.: Sewage treatment plant	300,000	No detailed plans made.
Falls Church, Va.: Sewer system and sewage treatment plant	170,000	Plans completed.
Leesburg, Va.: Construction of sewers and complete treatment plant	140,000	Preliminary report made.
Staunton, Va.: Sewage treatment plant	244,000	Plans completed.
Washington Suburban Sanitary District, Md.: Anacostia River and Little Falls Branch. Sewer system	925,000	Preliminary plans made.
Waynesboro, Va.: Construction of sewers and complete sewage treatment plant	100,000	Preliminary report made.
Recreation:		
Restoration of Chesapeake & Ohio Canal as recreational waterway and extension of George Washington Memorial Parkway.	9,100,000	Authorized by Congress in part.
Water supply:		
Adamstown, Cheltenham, Libertytown, Keedysville, Sharpburg, Waldorf, Walkersville, and Vindex, Md.: Water supply systems	185,000	No plans made.
Beltsville, Md.: National agriculture-research center. Additions to present waterworks system	90,000	Plans not completed
Beltsville, Md.: U. S. Bureau of Plant Industry. Improvement and extension of waterworks and irrigation systems.	46,000	
Buckeystown, Kitzmillersville, Lewistown, Point of Rocks, and Woodsboro, Md.: Water supply systems.	125,000	No plans made.
Crabbottom, Va.: Development of springs and construction of mains	9,000	Plans completed.
Cresaptown, Md.: Water-supply system	100,000	Preliminary plans made.
Cumberland, Md.: Evitts Creek development. Additional water supply	1,000,000	Do.
Cumberland and upper Potomac River, Md.: Savage River Dam for regulating flow of Potomac River.	1,600,000	Plans in preparation.
Fairfield, Fannettsburg, Iron Springs, Marion, McKnightstown, Mont Alto, Quincy, Scotland, and Wellersburg, Pa.: Water-supply systems.	222,000	No plans made.
Herndon, Va.: Water-supply system	68,000	Preliminary plans made.
Kinsale, Va.: Water-supply system	30,000	No plans made.
Luray, Va.: Construction of mains and development of new water supply	60,000	Preliminary plans made.
Marshall, Va.: Development of new water supply	39,000	Do.
Washington Suburban Sanitary District, Maryland: Great Seneca Creek water-supply development	650,000	Do.
Washington Suburban Sanitary District, Maryland: Paint Branch water-supply development	160,000	Do.
Winchester, Va.: Development of water supply from Cedar Creek	532,000	Plans completed.
Lower Chesapeake:		
Drainage:		
Essex, Gloucester, King and Queen, and Middlesex Counties, Va.: Cleaning of Dragon River to improve flow and for mosquito control.	81,000	Preliminary survey made.
Flood control:		
Madison County, Va.: Clearing river channels for flood control	7,000	Survey completed.
Navigation:		
King and Queen, King William, Lancaster, Middlesex, and Northumberland Counties, Va.: Dredging navigation channels in Mattaponi River, Carters Creek, Mill Creek, and Cockrells Creek.	98,000	Surveys completed.
Water supply:		
Parksley, Va.: Waterworks system	39,000	Preliminary plans made.
James:		
Drainage:		
Charles City, Chesterfield, Dinwiddie (Petersburg), Goochland, Hanover (Ashland), Henrico (Highland Springs), James City (Williamsburg), Norfolk, Powhatan, Princess Anne, Prince Edward, and Prince George Counties, Va.: Drainage for mosquito control	126,000	Preliminary surveys made.
Navigation		
Hampton Creek and Phoebus Channels, Va.: Dredging to improve navigation	88,000	Survey made. Authorized by Congress.
James River, Va.: Dredging 25-foot channel from Hopewell to Richmond	1,186,000	Cost is given for first 2 years. Additional needed to complete, $61,000. Survey completed.
Richmond, Va.: James River, dredging channel above city wharf for navigation	29,000	Plans completed.
Pollution:		
Albemarle County, Va.: Sewer system and sewage treatment plant for Fry Springs sanitary district	84,000	Preliminary plans made.
Campbell County, Va.: Partial sewage treatment plant for Brookville sanitary district	95,000	Do.
Fort Monroe, Va.: Sewage treatment plant	52,000	Survey completed.
Hampton, Newport News, Norfolk, Phoebus, Portsmouth, South Norfolk, etc., Va.: Combined project for sewers and sewage treatment plant.	8,000,000	Preliminary survey made.
Kecoughtan, Va.: Sewage treatment plant	25,000	Survey in progress.
Virginia Beach, Va.: Sewage treatment plant	150,000	Preliminary only.
Water supply:		
Fort Monroe, Va.: Improvement of Big Bethel water supply	145,000	Preliminary sketches made.
Kecoughtan, Va.: Renewal of water supply system	12,000	Survey in progress
Windsor, Va.: Water supply system	24,000	Plans completed.
Roanoke		
Drainage:		
Bedford, Charlotte, Dinwiddie, Greensville, Lunenburg, Mecklenburg, Prince George, Princess Anne, Southampton, and Sussex Counties, Va.: County-wide drainage projects.	137,000	Preliminary plans made.
Pollution.		
Charlotte Court House, Va.: Sewer system, and sewage treatment plant	24,000	Plans completed.
Halifax Court House, Va.: Sewer system and sewage treatment plant	19,000	Preliminary report ready.
Schoolfield, Va.: Sewer system	25,000	Plans not started.
Waverly, Va.: Sewer system and sewage treatment plant	96,000	Preliminary report ready.
Roanoke County, Va.: Sewer system for Williamson Road sanitary district	271,000	Plans completed.

Middle Atlantic Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Roanoke—Continued.		
Pollution and water supply:		
Bedford County, Va.: 5 septic tanks and 9 wells for county schools	$17,000	Plans completed.
Blackstone, Va.: Water supply, sewer system, and sewage treatment plant	125,000	Do.
Colerain, N. C.: Water supply system, sewers, and sewage treatment plant	31,000	Do.
Creswell, N. C.: Water supply and sewer systems	47,000	Do.
Gatesville, N. C.: Water supply system, sewers, and sewage treatment plant	25,000	
Halifax, N. C.: Water supply system, sewers, and sewage treatment plant	60,000	
Manteo, N. C.: Water and sewer systems	73,000	Do.
Rich Square, N. C.: Water supply system, sewers, and sewage treatment plant	104,000	Preliminary plans made.
Seaboard, N. C.: Water supply system, sewers, and sewage treatment plant	67,000	Do.
Stoneville, N. C.: Water supply system, sewers, and sewage treatment plant	75,000	Do.
Yanceyville, N. C.: Water supply system, sewers, and sewage treatment plant	64,000	Do.
Water supply:		
Columbia, N. C.: Extensions to water supply system	41,000	
Halifax, Va.: Water supply system	52,000	Plans completed.
LaCrosse, Va.: Water supply system	38,000	Do.
Pittsylvania County, Va.: Water supply, 8 wells at county schools	6,000	Plans not started.
Plymouth, N. C.: Water supply system	65,000	Preliminary plans made.
Powellsville, N. C.: Water supply system	11,000	Do.
Winton, N. C.: Water supply system	87,000	Do.
Tar-Neuse:		
Pollution:		
Hillsboro, N. C.: Sewer system	96,000	
Middlesex, N. C.: Sewer system	31,000	
Raleigh, N. C.: Sewage tratment	790,000	Do.
Stantonsburg, N. C.: Sewer system	40,000	Do.
Tarboro, N. C.: Sewage treatment	245,000	Do.
Pollution and water supply:		
Battleboro, Creedmoor, Everett, Farmville, Four Oaks, Grimesland, Nashville, Oriental, Pikeville, Pink Hill, Princeton, Stem, Vanceboro, Walstonburg, Winterville, and Youngsville, N. C.: Water supply and sewer systems.	966,000	
Wilson, N. C.: Water supply and sewer system	998,000	Do.
Water supply:		
Garner, N. C.: Water supply system	35,000	
Selma, N. C.: Water supply system	74,000	Do.
Cape Fear:		
Navigation:		
Smith's Creek, N. C.: Dredging channel	11,000	Surveys completed.
Pollution:		
Durham, N. C.: Sewage treatment works extension	350,000	Report and estimates in preparation.
Jonesboro, N. C.: Sewage treatment plant	51,000	
Morehead City, N. C.: Sewage treatment plant	231,000	Preliminary plans and estimates made.
Pollution and water supply:		
Archdale and Trinity, N. C.: Water supply system and sewage treatment plants	173,000	
Beulaville, N. C.: Water supply and sewer systems	33,000	
Cameron, N. C.: Water supply and sewer systems	27,000	
Carthage, N. C.: Water supply system and sewage treatment plant	58,000	
Garland, N. C.: Water supply system and sewage treatment plant	33,000	
Hope Mills, N. C.: Water supply system and sewage treatment plant	80,000	
Liberty, N. C.: Waterworks extensions and sewage treatment plant	18,000	
Rose Hill, N. C.: Water supply system and sewage treatment plant	67,000	Do.
Salemburg, N. C.: Water supply system and sewage treatment plant	40,000	Do.
Peedee:		
Drainage:		
Chesterfield, Clarendon, Darlington, Dillon, Florence, Georgetown, Harry, Lee, Marion, Marlboro, Sumter, and Williamsburg Counties, S. C.: Drainage for malaria control.	280,000	Preliminary plans made.
Pollution:		
Albemarle, N. C.: Sewage treatment plant and incinerator	280,000	Do.
Benton Heights, N. C.: Sewer system and sewage treatment plant	36,000	
Concord, N. C.: Sewage treatment plant	195,000	
Darlington, S. C.: Sewage treatment plant	75,000	Do.
Loris, S. C.: Sewer system and sewage treatment plant	58,000	Do.
Rockingham, N. C.: Sewage treatment plant	31,000	Do.
Statesville, N. C.: Sewage treatment plant and extensions to sewer system	293,000	Do.
Pollution and water supply:		
Clarkton, N. C.: Water supply and sewer system; sewage treatment plant	40,000	
Denton, N. C.: Water supply and sewer system; sewage treatment plant	86,000	
Fair Bluff, N. C.: Water supply and sewer system	76,000	
Landis, N. C.: Water supply and sewage systems; sewer treatment plant	176,000	
Mooresville, N. C.: Extensions to water supply and sewer systems; sewage treatment plant enlargement.	127,000	
Oakboro, N. C.: Water supply and sewer system; septic tanks	60,000	Do.
Parkton, N. C.: Water supply and sewer system; treatment plant	49,000	Do.
Pembroke, N. C.: Water supply and sewer system; sewage treatment plant	57,000	Do.
Pilot Mountain, N. C.: Water supply and sewer system; Imhoff tank	127,000	Do.
Rockwell, N. C.: Water supply and sewer system; sewage treatment plant	80,000	Do.
Rural Hall, N. C.: Water supply and sewer system; sewage treatment plant	73,000	Do.
Sumter, S. C.: Sewage treatment plant and extensions to water supply and sewer systems	96,000	Do.
Tabor City, N. C.: Sewer system with treatment plants; water supply extension	104,000	Do.
Water supply:		
Bladenboro, N. C.: Water supply system	38,000	
Shallotte, N. C.: Water supply system	38,000	Do.
Santee:		
Drainage:		
Berkeley, Calhoun, Charleston, Clarendon, Dorchester, Lexington, Richland, Sumter, and Williamsburg Counties, S. C.: Drainage for malaria control.	160,000	Do.
Charleston ordnance depot, South Carolina: Drainage project and filling swamp area for mosquito control.	7,000	
Davidson Creek drainage district, Iredell and Mecklenburg Counties, N. C.: Drainage project	18,000	
Erosion:		
Calhoun County, S. C.: Soil erosion control	225,000	Preliminary plans made.
Pollution:		
Belmont, N. C.: Sewage treatment plant	30,000	Plans and estimates made.
Hickory, N. C.: Sewage treatment plant	216,000	
Lenoir, N. C.: Sewage treatment plant	251,000	
Morganton, N. C.: Sewage treatment plant	120,000	Preliminary plans made.
Summerville, S. C.: Sewer system and sewage treatment plant	113,000	Preliminary plans completed.
Tryon, N. C.: Sewage treatment plant	100,000	Preliminary plans made.

Middle Atlantic Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Santee—Continued		
Pollution and water supply:		
Camp Jackson, near Columbia, S. C.: Water supply and sewer systems	$140,000	Preliminary plans made.
Kings Mountain, N. C.: Extensions to water supply and sewer systems; new sewage-treatment plant	96,000	
Moncks Corner, S. C.: Water supply and sewer systems and sewage-treatment plant	69,000	Do.
Pineville, N. C.: Water supply and sewer systems	62,000	Do.
St. Stephen, S. C.: Water supply and sewer systems and sewage-treatment plants	53,000	Do.
Tucapau, S. C.: Water supply and sewer systems	82,000	Do.
Valdese, N. C.: Water supply and sewer systems	106,000	
Water supply:		
Charlotte, N. C.: Extension of filtration plant and raw water supply; ground storage and elevated storage for clear water	1,000,000	No plans made.
Claremont, N. C.: Water-supply system	38,000	
Ebenezer, S. C.: Water-supply system	17,000	Preliminary plans completed.
Ellenboro, N. C.: Water-supply system	36,000	
Greenville, S. C.: Water-supply system (Westville water and sewer subdistrict)	21,000	Do.
Leesville, S. C.: Water-supply system	51,000	Preliminary plans made.
Long View, N. C.: Water-supply system	60,000	Do.
Matthews, N. C.: Water-supply system	36,000	
Sullivans Island, S. C.: Water-supply system	133,000	Do.
Waxhaw, N. C.: Water-supply system	38,000	Do.
Edisto:		
Drainage:		
Aiken, Allendale, Bamberg, Barnwell, Beaufort, Calhoun, Colleton, Dorchester, Edgefield, Hampton, Jasper, Lexington, Orangeburg, and Saluda Counties, S. C.: Drainage work throughout Edisto Basin for malaria control.	250,000	Do.
Pollution:		
Hampton, S. C.: Sewer system and sewage treatment plant	49,000	Do.
Water supply:		
Bowman, S. C.: Water supply system	27,000	Do.
Norway, S. C.: Water supply system	27,000	Do.
Ohar, S. C.: Water supply system	27,000	Do.
Sycamore, S. C.: Water supply system	11,000	Do.
Yemassee, S. C.: Water supply system	33,000	Do.
GROUP B—FOR DEFERRED CONSTRUCTION		
Upper Chesapeake		
Drainage:		
Baltimore, Md.: Vail Street storm drain	$60,000	Preliminary plans made
Flood control:		
Salisbury, Md.: Flood gates and spillway at Shoemakers Pond	20,000	Do.
Pollution.		
Baltimore County metropolitan district, Maryland: Sewer system extensions and sewage treatment plant	750,000	Do.
Baltimore, Md.: Chesapeake outfall sewer	1,156,000	Do.
Bowie, Cecilton, Fairlee, Galena, Goldsboro, Hebron, Marion, Millington, Prince Frederick, Solomons, Still Pond, Sudlersville, Sykesville, Trappe, and Upper Marlboro, Md.: Sewer systems and sewage treatment plants.	373,000	Plans have not been made for any of these projects except Goldsboro, which has partial plans.
Denton, Mount Airy, Pocomoke City, and Snow Hill, Md.: Sewer system extensions and sewage treatment plants.	190,000	Plans complete for Mount Airy, and partial plans for Denton, Pocomoke City, and Snow Hill
Ferndale, Glen Burnie, Homewood-Germantown, Linthicum Heights, and Overlook, Md.: Sewer system extensions.	42,000	Preliminary plans made for each project.
Salisbury, Md.: Sewage treatment plants	250,000	Plans have not been made.
Sharptown and Vienna, Md.: Sewage treatment plant	50,000	Partial plans made for each project.
Water supply:		
Baltimore, Md.: Raise Loch Raven water supply reservoir	17,200,000	Preliminary plans made.
Baltimore, Md.: Strengthen Loch Raven-Montebello water supply tunnel	1,800,000	Do.
Fairlee, Md.: Water supply system	20,000	Plans have not been made.
Washington suburban sanitary district, Maryland: Additional water supply on Patuxent	1,000,000	Preliminary plans made
Potomac		
Pollution:		
Adamstown, Boonsboro, Brunswick, Clear Spring, Cresaptown, Funkstown, Keedysville, La Plata, Leonardtown, Libertytown, Myersville, New Windsor, Taneytown, Thurmont, Union Bridge, and Walkersville, Md.: Sewer systems and sewage treatment plants.	605,000	
Arlington Experiment Farm, Broadway, Front Royal, Herndon, Lorton, Middleburg, and Shenandoah, Va.: Sewer systems and sewage treatment plants.	230,000	Complete plans for Broadway, Front Royal, Herndon, Lorton, and Shenandoah; plans not complete for Middleburg; no detailed plans for Arlington Experiment Farm.
Buckeystown, Kitzmillersville, Lewistown, Point of Rocks, Sharpsburg, Vindex, Waldorf, and Woodsboro, Md.: Sewer systems and sewage treatment plants.	190,000	No plans made.
Colonial Beach, Dayton, Elkton, Harrisonburg, Luray, Monterey, Stanley, Stephens City, and Stuarts Draft, Va.: Sewer systems and provision for partial treatment of sewage.	315,000	Preliminary report made.
Edinburg, Fort Belvoir, Mount Jackson, Purcellville, Round Hill, Strasburg, Timberville, Vienna, and Woodstock, Va.: Sewer systems and provision for treatment of sewage.	255,000	Do.
Greencastle, Hyndman, Littlestown, McConnelsburg, and Mercersburg, Pa.: Sewer systems and primary treatment plants.	125,000	No plans made
Lower Chesapeake Bay.		
Drainage:		
Caroline, Essex, Gloucester, Hanover, King William, Lancaster, Middlesex, Northumberland, Richmond, Spotsylvania, Westmoreland, and York Counties, Va.: Drainage work for mosquito control	30,000	Preliminary surveys made
Erosion:		
Langley Field, Va.: Sea wall to protect laboratory	100,000	Preliminary plans made.
Navigation:		
Lancaster and Mathews Counties, Va.: Complete channel in creek at Mathews, and build two jetties at Windmill Creek	14,000	Surveys completed
Pollution.		
Bowling Green, Cape Charles, Chincoteague, Gloucester, Gordonsville, Madison, Marshall, Mineral, Onancock, Parksley, Reedville, Sperryville, and Washington, Va.: Sanitary sewers and sewage treatment plants	390,000	Preliminary report made.
Orange, Va.: Sewage-treatment plant for complete treatment	20,500	Do.
Urbanna and West Point, Va.: Sewage treatment plants	40,000	Do.
Water supply		
Accomac and Eastville, Va.: Water supply, wells, and distributing systems	55,000	Do.

Middle Atlantic Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
James:		
Flood control:		
Amelia, Cumberland, and Prince Edward Counties, Va.: Flood protection, project on creeks at the following locations: Farmville, Little Guinea, Sandy and Flat Creeks.	$6,000	Plans completed.
Navigation:		
Lafayette River, Va.: Dredging yacht basin	16,000	Surveys made.
Manchville, Va.: Dredging Deep Creek for navigation	34,000	Survey completed.
Pollution:		
Amelia, Appomattox, Amherst, Buchanan, Burkeville, Chester, Charlottesville, Claremont, Clifton Forge, Colonial Heights, Craigsville, Crozet, Fincastle, Glasgow, Goshen, Highland Springs, Iron Gate, Lovingston, Millboro, Newcastle, Smithfield, Stanardsville, and Windsor, Va.: Sewer systems and sewage-treatment plants.	750,000	No plans made.
Water supply:		
Amelia and Appomattox, Va.: Water-supply systems	58,000	Do.
Roanoke:		
Pollution:		
Roanoke, Va.: Sewage-disposal plant	250,000	Preliminary investigation made.
Altavista, Bassett, Bedford, Boones Mill, Boykins, Cambria, Chase City, Chatham, Crewe, Danville, Dendron, Franklin, Ivor, Keysville, Lacrosse, Martinsville, Salem, Shawsville, South Boston, Stony Creek, Stuart, Surry, and Vinton, Va.: Sewer systems and sewage-treatment plants.	760,000	Do.
Water supply:		
Bassett, Va.: New wells for water supply	40,000	Preliminary study made.
Tar-Neuse:		
Flood control:		
Baker's Mill, N. C.: Flood control on Little River	873,000	Preliminary surveys and estimates made.
Falls, N. C.: Flood control on Neuse River	1,332,000	Do.
Wiggin's Mill, N. C.: Flood control on Contentnea Creek	625,000	Do.
Wilson Mills, N. C.: Flood control on Neuse River	1,460,000	Do.
Navigation:		
Bayboro, N. C.: Cleaning and improving Bay River Channel for navigation	9,000	Surveys completed.
Tarboro to Rocky Mount, N. C.: Cleaning and dredging of Tar River Channel for 39 miles	83,000	Plans and surveys made.
Cape Fear:		
Navigation:		
Morehead City, N. C.: Harbor inlet jetties	1,000,000	Survey completed; construction delayed pending further observations of inlet-scour.
Pamlico Sound to Beaufort, N. C.: Dredging channel to Atlantic, North Carolina	13,000	Surveys completed.
Peedee:		
Drainage:		
Lee County, Ashwood Rural Community, S. C.: Drainage	29,000	Preliminary plans completed.
Navigation:		
Georgstown County, S. C.: Dredging navigable channel of Winyah Bay	136,000	Plans completed.
Pollution:		
Lake City, S. C.: Sewage treatment plant	40,000	Preliminary plans completed.
Myrtle Beach, S. C.: Sewer system and sewage treatment plant	200,000	Do.
Water supply:		
Greeleyville, S. C.: Water supply system	31,000	Do.
Olanta, S. C.: Water supply system	29,000	Do.
Santee:		
Navigation:		
Charleston, S. C.: Dredging channel of Ashley River, 7¼ miles long from mouth of river to Standard Wharf, for navigation.	340,000	Surveys completed.
Pollution:		
Lancaster, S. C.: Sewage-treatment plant	170,000	Preliminary plans made.
Pollution and water supply:		
Pelzer, S. C.: Water-supply and sewer extensions	204,000	Do.
Edisto:		
Drainage:		
Orangeburg and suburbs, South Carolina: Storm drainage, deepening and widening ditches	26,000	Do.
Orangeburg County, S. C.: Clearing 10 miles of South Fork Edisto River Channel; and 23 miles of North Fork Edisto River Channel.	35,000	Plans completed.
Pollution:		
Beaufort, S. C.: Sewage-treatment plant	50,000	Recommend further study.
Orangeburg, S. C.: Sewage-treatment plant	125,000	No plans made.

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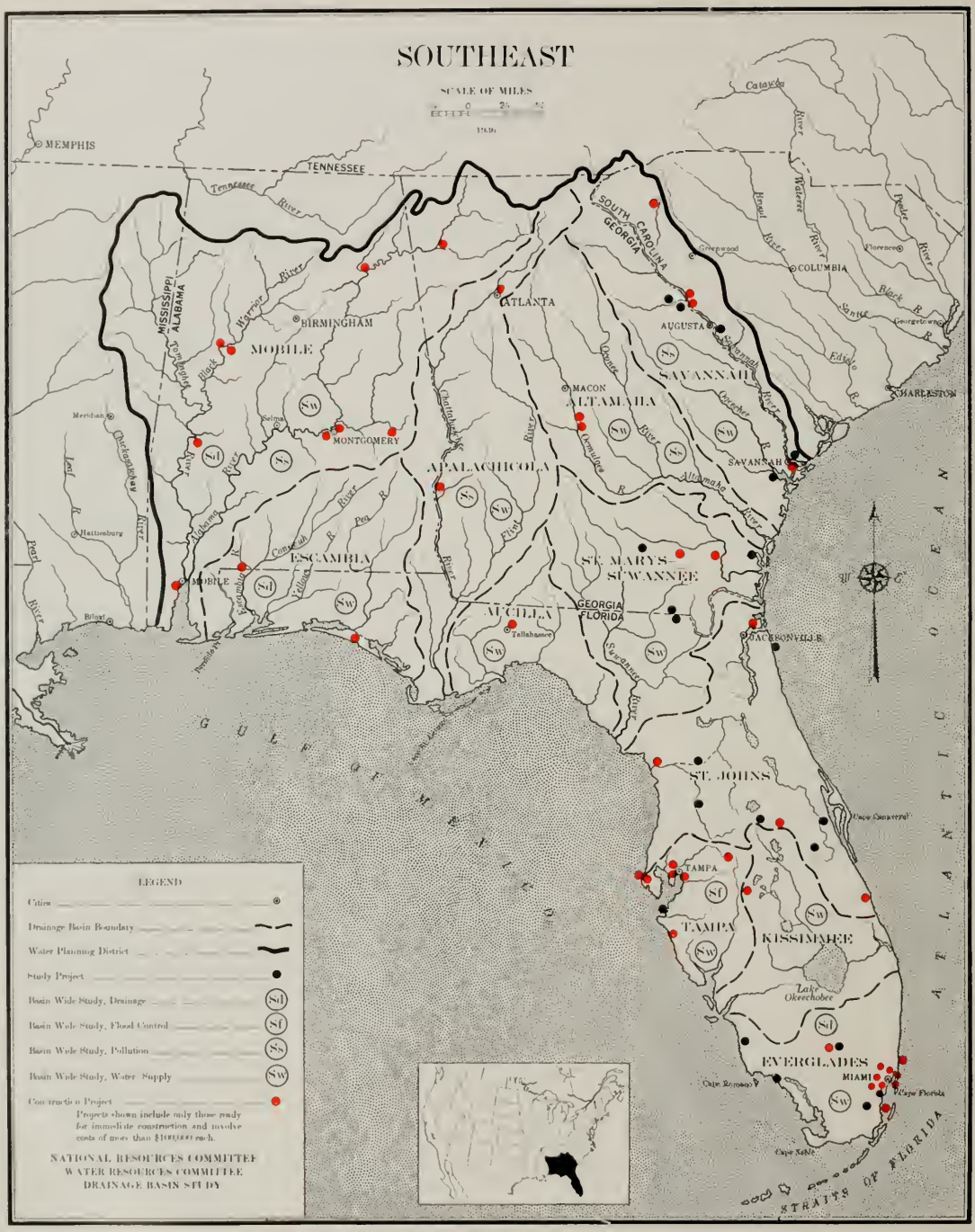

SOUTHEAST
SCALE OF MILES
MEMPHIS
TENNESSEE
Tennessee River
MISSISSIPPI
ALABAMA
Warrior River
BIRMINGHAM
MOBILE
Black R.
Alabama River
Tombigbee River
Tom Bigbee Waterway
Pearl River
Leaf R.
Chickasawhay River
Meridian
Hattiesburg
Bilbxi
Selma
MONTGOMERY
Tallapoosa R.
Coosa River
ATLANTA
MACON
ALTAMAHA
Ocmulgee R.
Oconee R.
Ocmulgee River
Altamaha River
SOUTH CAROLINA
GEORGIA
Catawba River
Broad River
Greenwood
Wateree River
COLUMBIA
Pee Dee River
Florence
Black R.
Santee R.
Georgetown
Edisto R.
AUGUSTA
Savannah River
SAVANNAH
SAVANNAH
CHARLESTON
APALACHICOLA
Chattahoochee River
Flint River
Ochlockonee River
Apalachicola River
ESCAMBIA
Yellow R.
Conecuh R.
Pea R.
Escambia River
MOBILE
Perdido R.
ST. MARYS
SUWANNEE
Suwannee River
ALTAMAHA
GEORGIA
FLORIDA
Tallahassee
JACKSONVILLE
GULF OF MEXICO
ATLANTIC OCEAN
ST. JOHNS
Cape Canaveral
TAMPA
TAMPA
KISSIMMEE
Lake Okeechobee
EVERGLADES
MIAMI
Cape Romano
Cape Florida
Cape Sable
STRAITS OF FLORIDA
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Study Project
Basin Wide Study, Drainage (Sd)
Basin Wide Study, Flood Control (Sf)
Basin Wide Study, Pollution (Sp)
Basin Wide Study, Water Supply (Sw)
Construction Project
Projects shown include only those ready for immediate construction and involve costs of more than $100,000 each.
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

Promotion of the public health by abatement of pollution in streams and bays, improvement of dwindling and unpotable water supplies, and drainage of malaria-infested lowlands are dominant water-resource needs of the southeast district. Improvements of these types are the objectives of most of the construction and study projects recommended in the accompanying project list. The needs for public sanitation outweigh those for beach-erosion control and for coastal-navigation facilities. They likewise overshadow the prospective needs for integrated programs of river regulation in upland areas.

Municipal sewer, sewage-disposal, and water-supply facilities have failed to keep pace with the growth of population and with technical improvements in many towns and cities of the Piedmont manufactural area, in commercial centers of the coastal plain of Alabama and Georgia, and in the fast-growing recreational resorts of Florida. Some urban areas are without sewer facilities. Others have sewer systems inadequate to carry away the rainfall from intense storms. Still others discharge raw or partially treated wastes into streams which serve as a source of water for cities or into coastal waters which support fisheries. The water supplies of certain cities on the coastal plain in Alabama and Georgia—many of them highly mineralized—are threatened by overdraft on underground reserves, and by salt contamination. In many municipalities in the Piedmont section inadequate wells should be replaced by reliable sources. Plans are now available for widespread extensions of sewer systems to communities hitherto unserved, for plants to treat raw sewage, for plants to treat relatively unpotable water, and for extension of water mains and water-storage facilities. Miami, Tampa, Tallahassee, Macon, and scores of smaller municipalities are involved.

Malaria takes a relatively heavy annual toll of human life, vigor, and comfort throughout parts of the district, especially in rural and small urban communities. Its incidence may be reduced materially by drainage of low-lying swamps, marshes, borrow pits, and other areas of stagnant water which serve as breeding grounds for the *Anopheles* mosquito. Individual drainage projects for this purpose are small in size, but they bulk large in the aggregate. They should be prosecuted widely and should be carried out judiciously in accordance with State- or basin-wide programs. Drainage of this type is not to be confused with drainage for agriculture, a large proportion of which has been unsuccessful in the southeast district.

Although a number of specific programs for municipal sanitation and malaria control are shown in the accompanying project list, a much larger volume of work remains which cannot be undertaken with confidence until comprehensive studies of pollution conditions, surface and underground water supplies, and drainage have been made in both Piedmont and Coastal Plain sections. Data concerning pollution and water supply are notably deficient, especially in Georgia.

Soil erosion has long been responsible for the depletion of agricultural resources in the Piedmont section of Georgia and in the uplands of Alabama, but surveys are lacking on which remedial work related primarily to water conservation might be based.

Beach-erosion control and navigation improvements are of moment at scattered points along the Gulf and Atlantic coasts of the district. Beach-protection works and studies looking to the preparation of designs for such works are essential to prevent the loss of commercial and recreational areas subject to rapid erosion during recurrent Gulf storms. Segments of the intracoastal waterway for small and medium-sized craft as authorized by the Congress are now incomplete. Steps to complete this coastal channel are recommended, together with a few harbor improvements.

In the basins of the streams flowing into Mobile Bay, the Apalachicola River, the Savannah River, and other upland streams of Alabama and Georgia, plans for the integrated development of river-regulation works for hydroelectric power, flood control, municipal water supply, and navigation doubtless will loom large in the future. In general, immediate construction of this kind is not in order because basin-wide studies looking toward multiple use of water are incomplete, because competitive aspects of the power market in the southeastern area demand that a careful survey be made before new hydroelectric plants are constructed, and because the requisite economic justification for additional navigation improvements is doubtful. Initiation of the Clark Hill project on the Savannah River and of other proposed hydroelectric plants should await completion of the recommended power-market survey.

Construction operations on the proposed Florida ship canal have been suspended due to lack of Congressional authorization. A further investigation of the project is in progress, however, and additional data upon the relation of the canal to underground water supplies are being collected. The committee reserves its recommendation pending review of those reports.

Southeast Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Savannah Basin:		
Water power:		
Clark Hill, Ga.: Project for flood control, navigation, and power development; investigation of engineering and economic aspects.	.....	To be included in general study of the power situation and of the proposed power projects in the Southeastern states.
Flood control:		
Study to determine feasible methods of flood protection of area of 140,000 acres along Ogeechee River below the Canoochee River, Ga.	$26,000	Preliminary studies made. Hearings scheduled.
Pollution:		
Augusta, Ga.: Study of extent of sewage pollution and health hazards	10,000	Cooperative investigation by State and local agencies.
Georgia and South Carolina: Study to determine extent to which pollution endangers public health throughout the Savannah Basin.	50,000	Cooperative investigation by State and Federal agencies.
Savannah, Ga.: Study of extent of sewage pollution and health hazards	10,000	Cooperative investigation by State and local agencies.
Altamaha:		
Pollution:		
Study to determine extent of pollution and to formulate a policy regarding sewage treatment in the Altamaha Basin, Ga.	30,000	
St. Marys-Suwannee:		
Pollution:		
Brunswick, Ga.: Study to determine proper plans for sewage-treatment plant	5,000	
Waycross, Ga.: Study to determine type and cost of sewage-treatment plant and sewer system	5,000	No plans.
Water supply:		
Study to determine the desirability of establishing swamp reservoirs in Okefenokee Swamp to serve as the source of recharging the underground water supply in Georgia and Florida.	30,000	Do.
St. Johns:		
Erosion (coastal):		
Study to prepare plans and estimates for control of beach erosion, North Atlantic Coastal Slope at Amelia Island (Fernandina Beach), Fort George Island, Jacksonville Beach, and vicinities.	50,000	
Flood control:		
Study to determine method for flood control on the Withlacoochee River	2,000	
Navigation:		
Study of Atlantic-Gulf Ship Canal, Florida: Navigation project to provide intercoastal ship canal-dredging jetties and accessory works.	.....	Now under investigation.
Study to determine plans for the improvement of navigation on the St. Johns River at or near Sanford, Fla., to Tampa, Fla., via Kissimmee and Alafia Rivers and Tampa Bay. Also, St. Johns River to Kissimmee River, Fla., and thence to Okeechobee. Cross-Florida canal channel: Navigation improvement; dredging.	5,000	
Study of surveys to determine cost and location of additional channels connecting the St. Johns River Basin and the Intra-coastal Waterway (East Coast Waterway) for navigation, flood control, and recreation by dredging and flood gates.	50,000	
Tampa:		
Erosion (coastal):		
Bradenton, Fla.: Studies and plans for beach erosion control	5,000	
Flood control:		
Basin-wide flood control studies	25,000	
Everglades:		
Erosion:		
Everglades Drainage Basin: Soil conservation, controlled drainage and irrigation	25,000	
Flood control:		
Bonita Springs, Lee County, Fla.: Flood-control studies	5,000	
Dade County, Fla: Flood-control studies in vicinity of Miami River	5,000	
Navigation:		
Florida Bay to Caloosahatchee River: Navigation channel	10,000	Would materially assist in development of Everglades National Park.
Recreation and wildlife:		
Everglades National Park and adjoining areas: Study of problems of management and development.	100,000	Joint study by interested agencies.
Apalachicola:		
Pollution:		
Study and survey of stream pollution throughout the basin to formulate policy regarding sewage treatment and to determine extent of pollution.	30,000	
Escambia:		
Drainage:		
Study of drainage for malaria control in specific areas with high malaria incidence	10,000	Pertains to construction project.
Mobile:		
Drainage:		
Study to determine drainage and reclamation projects necessary for malaria and mosquito control throughout the basin.	50,000	
Pollution:		
Study to determine means for pollution control of streams by gathering data on domestic and industrial waste throughout the basin.	50,000	
2. Construction Projects		
Savannah:		
Drainage:		
Aiken County, S. C.; Candler County, Ga.; Hampton and Jasper Counties, S. C.; Jefferson and McIntosh Counties, Ga.: Malaria control and drainage.	399,000	Under varying degrees of completion.
Augusta, Ga.: Channel improvements in Rocky Creek to improve drainage and sanitary conditions.	151,000	Plans and specifications completed.
Erosion (coastal):		
Fort Screven, Ga.: Seawall to prevent beach erosion	92,000	Study completed.
Flood control:		
Augusta, Ga.: Completion of earth levee and concrete retaining wall for flood protection	685,000	Plans completed. Authorized by Congress, approximately 50 percent complete.
Navigation:		
Augusta, Ga.: Completion of lock and dam and bank protection for navigation on Savannah River below Augusta.	862,000	Surveys completed.
Savannah, Ga.: 30-foot navigation channel from ocean to city	467,000	Plans completed.
Pollution:		
Hones Path, S. C.: Improvements to waterworks system and sewage-treatment plant	40,000	Preliminary plans completed
Recreation and wildlife:		
Savannah, Ga.: Water-impounding structures to provide migratory bird refuge	25,000	Do.
Water supply:		
Crawfordville, Ga.: Water supply and distribution system	33,000	

Southeast Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Altamaha:		
Drainage:		
Appling, Ben Hill, Bibb, Bleckley, Butts, Candler, Clarke, Clayton, Coffee, De Kalb, Dodge, Dooly, Glynn, Greene, Gwinnett, Jackson, Jasper, Jefferson, Johnson, Laurens, McIntosh, Oconee, Peach, Pulaski, Telfair, Treutlen, Twiggs, and Wayne Counties, Ga.: Drainage and malaria control.	$485,000	Under varying degrees of completion.
Macon, Ga.: Trunk line storm sewer to eliminate open drains	270,000	Preliminary plans in progress.
Pollution:		
Macon, Ga.: Sewer system and sewage-treatment plant	178,000	Preliminary plans made.
St. Marys-Suwannee:		
Drainage:		
Alachua County, Fla.; Berrien County, Ga.; and Bradford County, Fla.: Construction of ditches and canals to drain agricultural lands.	25,000	Preliminary plans completed.
Recreation and wildlife:		
Brantley and Ware Counties, Ga.: Stream improvements, recreational lakes, game refuge, and forestry near Waycross, Ga.	203,000	Resettlement Administration likely to complete this project before fiscal year 1938.
Water supply:		
Madison and Mayo, Fla.; St. Marys, Ga., and Waldo, Fla.: Waterworks and distribution systems	121,000	Plans complete for St. Marys, Ga., and Madison, Fla. Preliminary plans only for Waldo and Mayo, Fla.
Trenton, Fla.: Waterworks and sewer system	30,000	Plans completed. Awaiting decision of Supreme Court on Senate Bill 515.
St. Johns:		
Drainage:		
Camp Foster near Yukon; Duval County, East Palatka, Jacksonville and Polk County, Fla.: Malaria and mosquito elimination.	203,000	Plans for Camp Foster project completed. Preliminary plans completed.
Duval, Putnam, St. Johns, and Volusia Counties, Fla.: Drainage for agricultural purposes	175,000	Preliminary plans completed.
Erosion:		
Neptune Beach, Fla: Erosion control by construction of concrete seawall	111,000	Do.
Navigation:		
Cedar Key, Fla.: Dredging harbor for improvement of navigation	4,000	Estimated cost given is amount needed for completion.
Jacksonville, Fla.: Dredging channel Jacksonville to Palatka for improvement of navigation	14,000	Do.
Jacksonville, Fla.: Dredging channel of St. Johns River to ocean for improvement of navigation	330,000	Do.
Leesburg, Fla.: Dredging channel of Ocklawaha River from St. Johns River to Leesburg for improvement of navigation.	36,000	Do.
Port Inglis, Fla.: Dredging channel of Withlacoochee River from Port Inglis to mouth for improvement of navigation.	100,000	Do.
Pollution:		
Leesburg, Fla.: Sewage-treatment plant	90,000	Preliminary plans completed.
Tavares, Fla.: Sewer system	82,000	Do.
Vero Beach, Fla.: Sewage-treatment plant	149,000	Do.
Pollution and water supply:		
Atlantic Beach, Port Orange and Winter Garden, Fla.: Waterworks systems	177,000	Do.
Camp Foster, near Yukon, Fla.: Extension of sewer and waterworks systems	69,000	Plans completed.
Jacksonville Beach, Fla.: Extension of water and sewer systems	47,000	Preliminary plans completed.
Water supply:		
Fruitland Park, Fla.: Extension of waterworks system	14,000	Do.
Orlando, Fla.: Waterworks extensions	617,000	Do.
Tampa:		
Erosion (coastal):		
Clearwater, Fla.: Construction of groins to protect and build up beaches	160,000	Study completed.
Pollution:		
Clearwater, Fla.: Extensions and improvements to sewer system	316,000	
Sarasota, Fla.: Extensions to sewer system	115,000	
Tampa, Fla.: Improvement to existing sewer system and installation of sewage-treatment plant	1,450,000	
Tampa, Fla.: Improvements to storm-sewer system	164,000	
Water supply:		
Tampa, Fla.: Improvements and extensions to water-supply system	1,760,000	
Winter Haven, Fla.: Improvement to water-supply system and sewage-treatment plant	160,000	
Everglades:		
Drainage:		
Dade County, Highland Section, Fla.: Drainage and water control	74,000	
Erosion:		
Delray Beach, Fla.: Retaining wall along intracoastal waterway to prevent bank erosion	23,000	
Navigation:		
Miami to Florida Bay, Fla.: Intracoastal waterway, 7-foot channel	130,000	Survey completed. Authorized by Congress.
Miami Harbor—Biscayne Bay, Fla.: Deepening harbor channels	800,000	Authorized by Congress: $2,200,000 has been spent on project.
Port Everglades—Hollywood Harbor, Fla.: Dredging 35-foot channel	930,000	Surveys completed. Authorized by Congress.
Pollution:		
Miami, Fla.: Sewage-treatment plant.	5,000,000	
Miami Beach, Fla.: Storm sewer for relief of flood conditions	391,000	
Recreation and wildlife:		
Everglades, Fla.: Establishment of national park	1,000,000	
Water supply:		
Miami, Fla.: Extensions to water-supply system for increasing distribution	500,000	
Miami, Fla.: 2 additional reservoirs for water supply	110,000	
Miami Beach, Fla.: Extensions to water-supply system for additional supply	407,000	
South Miami, Fla.: Water-supply system for Greater Miami area	221,000	
Aucilla:		
Pollution:		
Tallahassee, Fla.: Extension to sewer system	265,000	Plans completed.
Thomasville, Ga.: Sewage-treatment plant and improvement to sewer system	94,000	Do.
Water supply:		
Cross City, Fla.: Water-supply system	36,000	Do.
Apalachicola:		
Drainage:		
Chattahoochee, Clay, Clayton, Coweta, Crawford, Crisp, Decatur, De Kalb, Dooly, Early, Fayette, Hall, Harris, Macon, Meriwether, Mitchell, Muscogee, Seminole, Talbot, Troup (2), Terrell, Taylor, Turner, and Worth Counties, Ga.: Malaria control.	491,000	Plans for most of the projects completed.
Pollution:		
Fort Gaines, Ga.: Sewer system	34,000	Plans completed.
Marianna, Fla.: Sewage-collecting system and treatment plant	65,000	Do.
Chipley, Ga.: Sewer system	18,000	Do.
Zebulon, Ga.: Sewer system and treatment plant	16,000	Do.

Southeast Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Apalachicola—Continued.		
Pollution and water supply:		
Cleveland, Ga.: Waterworks, sewer system, and sewage-treatment plant	$39,000	Plans completed.
Cumming, Ga.: Water supply and sewer systems	44,000	Do.
Water supply:		
Ashford, Ala.: Water-supply system	28,000	Do.
Atlanta, Ga.: Filtration plant	695,000	Preliminary plans completed.
Butler, Ga.: Water-supply system	22,000	Do.
Cottondale, Fla.: Water-supply system	36,000	Do.
Demorest, Ga.: Water-supply system	32,000	Do.
Eufaula, Ala.: Dam and storage reservoir, water-treatment plant, and mains	105,000	Plans completed. Land acquired.
Fort Benning, Ga.: Improvement to waterworks	105,000	Preliminary study made. Land acquired.
Fort Benning, Ga.: New storage reservoir	75,000	Preliminary sketches made. Land acquired.
Meansville, Ga.: Water-supply system	24,000	Plans completed.
Midway, Ala.: Water-supply system	31,000	Do.
Port St. Joe, Fla.: Water-supply system	36,000	Do.
Senoia, Ga.: Well, elevated tank and distribution system for water supply	36,000	Preliminary plans completed.
Union City, Ga.: Water-supply system	25,000	Do.
Escambia:		
Flood control:		
Flomaton, Ala.: Levees or improvement of flood channels	154,000	Authorized by Congress.
Brewton, Ala.: Levees or improvement of flood channels	242,000	Do.
Navigation:		
Choctawhatchee Bay to West Bay, Fla.: Intracoastal waterway extension; dredging 26-mile channel 100 feet wide, 9 feet deep.	770,000	Plans under way. Authorized by Congress.
Pollution:		
Dothan, Ala.: Improvements to sewer system	48,000	
Frisco City, Ala.: Sewer system with septic tank	30,000	
Milton, Fla.: Sewage-treatment plant for primary treatment	44,000	Plans completed.
Pensacola, Fla.: Improvements to sewer system	84,000	Do.
Water supply:		
Pensacola, Fla. Additional water supply with installation of new wells	26,000	Do.
Mobile:		
Drainage:		
Drainage for malaria control throughout the basin	1,968,000	Preliminary plans completed. This is dependent upon study project.
Drainage and navigation:		
Itawamba County, Miss.; Jefferson County, Ala.; Lee and Monroe Counties, Miss.: Drainage canal projects for mosquito control, land reclamation and channel improvement.	188,000	Plans completed.
Navigation:		
Clark and Washington Counties, Ala.: Dredging cut-off canal at Sunflower bend on the Tombigbee River from mile 78 to mile 90 for navigation and flood control.	335,000	Plans completed. Cost includes $37,000 for land and damages.
Clark and Washington Counties, Ala.: Dredging channel for 9-foot depth on the Tombigbee River from mouth to dam and lock no. 1 at mile 111, for navigation and flood control.	30,000	Plans completed. Authorized by Congress. Under construction.
Tombigbee-Warrior Rivers, Ala.: Installing temporary 1-foot flashboard on dams no. 1 to no. 9, inclusive, to increase channel depth from mouth to lock no. 10.	36,000	Plans completed. Authorized by Congress.
Tuscaloosa County, Ala.: Construction of new dam and lock no. 10 on Warrior River at mile 361 near Tuscaloosa, Ala., to replace dams nos. 10, 11, and 12.	2,550,000	Plans completed. Authorized by Congress. Amount needed to complete project. Cost includes $25,000 for land and damages.
Pollution:		
Alexander City, Ala.; Baldwyn, Miss.; and Berry, Bonz, Camden, Fort Payne, Gadsden (Club Heights), Grove Hill, Hamilton, Livingston, Oakman, Talladega, Ala.: Sewer systems and extensions.	448,000	Plans completed.
Attalla, Blocton, Cordova, Goodwater, Jacksonville, Jasper, Leeds, Linden, Opelika, and Sylacauga, Ala.: Sewer systems or extensions.	455,000	Do.
Auburn and Jasper, Ala.: Sewage-treatment plants	97,000	Preliminary plans completed.
Gadsden, Ala.: Sewage-treatment plant	390,000	Do.
Montgomery, Ala.: Sewage-treatment plant for complete treatment	220,000	Plans completed.
Pollution and water supply:		
Akron and Ashville, Ala.; LaFayette, Ga.; and Pine Hill, and Wadley, Ala.: Waterworks and sewer systems.	258,000	Do.
Water supply:		
Blocton, Center, Eclectic, Lafayette, and Wilton, Ala.: Water-supply systems	190,000	Do.
Boston, Brent, and Cuba, Ala.; East Tupelo, Miss.; Gordo, Haleyville, Helena, Jackson, and Kennedy, Ala.; Maben, Miss.; Marion, Montgomery, Oakman, Pleasant Grove, and Raglund, Ala.; Saltillo, Miss., Talladega and Wilsonville, Ala.: Waterworks and water-supply systems or extensions.	611,000	Do.
Montgomery, Ala.: Improvements and extensions to waterworks system, including 6 wells, pumps, and storage tank.	340,000	Do.
Rome, Ga.: Improvements and extensions to waterworks system	240,000	Do.
Tuscaloosa, Ala.: Extensions to waterworks system	47,000	Do.
Tuskegee, Ala.: Water supply and waterworks improvements	113,000	Do.
GROUP B—FOR DEFERRED CONSTRUCTION		
Savannah:		
Drainage:		
Hartwell, Ga.: Deepen channels, ditch swampy ground, and eliminate mosquito-breeding places	$32,000	Plans and specifications ready.
Savannah River Basin, Ga. and S. C.: Malaria control, drainage and maintenance to continue present program.	775,000	No plans.
Erosion:		
Georgia and South Carolina: Soil and water conservation by reforestation, terracing, and other methods of controlling erosion throughout the basin.	2,000,000	First program of operation subject to results of preliminary survey.
Pollution:		
Abbeville, Allendale, S. C.; Brooklet, Ga.; Central, S. C.; Claxton, Ga.; Edgefield, S. C.; Guyton, Ga.; Liberty, McCormick, S. C.; Midville, Millen, Newington, Ga.; North Augusta, S.C.; Pembroke, Ga.; Pickens, S. C.; Pooler, Rocky Ford, Ga.; Seneca, Springfield, S. C.; Sylvania, Ga.; Walhalla, S. C.; Waynesboro, Ga., and Westminster, S. C.: Sewage collection and treatment works.	690,000	Reported by State boards of health as needed to promote public health.
Water power:		
Abbeville, S. C.: Dam generating plant, transmission lines; dam located 15 miles west of city, on Rocky River.	435,000	Awaiting compliance of town to acquire improved property.
Westminster, S. C.: Hydroelectric plant, 4½ miles west of city; dam and reservoir	118,000	Further study necessary to determine feasibility of project.

Southeast Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Savannah—Continued.		
Water supply:		
Augusta, Ga.: Additions to water distribution system and modernization of treatment plant	$201,000	Study necessary before plans can be completed.
Brooklet, Claxton, Louisville, Midville, Millen, Pembroke, Sandersville, Savannah, Statesboro, Wadley, Ga.: Waterworks additions and extensions. Hilltonia, Portal, and Twin City, Ga.: Water supplies.	390,000	
Wrens, Ga.: Improvements to waterworks system and sanitary sewers	75,000	Do.
Miscellaneous:		
Walhalla, S. C.: Extension of fish cultural facilities at hatchery, 24 miles from Walhalla	25,000	U. S. Bureau of Fisheries has completed plans.
Altamaha:		
Drainage:		
Lower Altamaha Basin, Ga.: Malaria control	610,000	
Water supply:		
Adrian, Alamo, Baxley, Cochrane, Collins, Glennville, Hawkinsville, Hazelhurst, Helena, Jesup, Lumber City, Lyons, Reidsville, Soperton, Swainsboro, Tennille, Vidalia, Wrightsville, Ga.: Waterworks additions and extensions. Ludowici, Ga.: Water supply.	570,000	
St. Marys-Suwannee:		
Drainage:		
Appling, Atkinson, Bacon, Ben Hill, Berrien, Brantley, Brooks, Camden, Clinch, Colquitt, and Coffee Counties, Ga.; Hamilton County, Fla.; Lanier and Lowndes Counties, Ga.; Madison, Suwannee, and Taylor Counties, Fla.; Tift, Turner, Wayne, and Worth Counties, Ga.: Ditches and canals to drain swamp areas for malaria control.	828,000	Preliminary plans only prepared. Actual plans not to be made until work progresses.
Flood control:		
Alachua, Bradford, and Union Counties, Fla.: Widening and straightening existing channels for flood control.	48,000	Preliminary plans completed.
Pollution:		
Douglas, Ga.: Sewer system and sewage-treatment plant	28,000	Plans and specifications completed.
Recreation and wildlife:		
Okefenokee migratory waterfowl refuge, Georgia and Florida: Construction of dam and improvements.	103,000	
Water supply:		
Branford, Fla.: Waterworks and system, including deep well and tank	29,000	Do.
MacClenny, Fla.: Waterworks and Diesel engine power plant	65,000	Preliminary plans completed.
Braxton and Douglas, Ga.: Waterworks improvements	60,000	
St. Johns:		
Flood control:		
Duval, Lake, Orange, and Pasco Counties, Fla.: Improvement of creek channels and canals	120,000	Do.
St. Augustine, Fla.: Flood control by construction of dam and spillway	15,000	Do.
Erosion:		
St. Johns River, Fla.: Protection of shore line by rock revetment	88,000	Under consideration by War Department.
Navigation:		
Melbourne, Fla.: Dredging new channel and turning basin of Melbourne Harbor and Inlet and Crane Creek for improvement of navigation.	12,000	Plans completed.
Recreation:		
Welaka, Fla.: Conservation project—Fish hatchery and game farm; construction of 50 acres of rearing ponds and accessory plant.	235,000	
Winter Garden, Fla.: Dredging canal from Winter Garden to Lake Apopka in connection with park improvements and recreation.	21,000	Preliminary plans prepared.
Kissimmee:		
Drainage:		
Glades County, Fla.: Drainage of agricultural lands in "Highlands" section	247,000	Further plans and study required.
Martin, Polk, and St. Lucie Counties, Fla.: Drainage projects for mosquito control	134,000	Plans insufficient. All interested agencies should be consulted.
Tampa:		
Drainage:		
Peace River Basin—Malaria and pest mosquito control by drainage in 6 counties	345,000	Plans insufficient. Further study necessary.
Erosion (coastal):		
Boca Ciega, Fla.: Construction of groins to protect beaches and improvements	216,000	Study almost completed by Beach Erosion Board.
Navigation:		
Charlotte Harbor, Fla.: Deepening and widening existing channel to 30 by 300 feet, from Gulf of Mexico to Boca Grande.	59,000	Surveys completed.
St. Petersburg Harbor, Fla.: Dredging channel 20 feet deep by 200 feet wide in Tampa Bay	123,000	
Clearwater and Sarasota, Fla.: Improvement and enlargement of ditches and canals for storm water drainage.	36,000	Plans insufficient. Further study necessary.
Everglades:		
Drainage:		
Fort Lauderdale, Fla. (in vicinity of Fort Lauderdale within Broward County anti-mosquito-control district): Drainage.	39,000	Further investigation required.
Monroe County, Fla.: Drainage for mosquito control	25,000	Do.
Ojus, Virginia Key and Tahiti Beach, Fla.: Mosquito control	78,000	Do.
Palm Beach County, Fla.: Drainage for mosquito control	39,000	Do.
Flood control and navigation:		
Fort Lauderdale, Fla.: New river channel to Fort Lauderdale, Fla; intracoastal waterway for navigation and flood control.	40,000	Surveys and plans completed.
Navigation:		
Miami Harbor, Fla.: Extending present turning basin	300,000	Surveys completed.
Palm Beach, Fla.: Deepening port to 27 feet	448,000	
Pollution:		
Miami Beach, Fla.: Extension to sewer system	245,000	Plans completed.
Aucilla:		
Drainage:		
Florida portion of basin: Drainage for malaria control	226,000	Plans not completed. Further study necessary.
Georgia portion of basin: Drainage for malaria control	117,000	Do.
Navigation:		
Dixie County, Fla.: Dredging channel 6 feet deep to Steinhatchee River	68,000	Do.
Increase depth of entrance channel to Steinhatchee River from 6 feet as now recommended to 9 feet	250,000	Do.
Wakulla County, Fla.: Dredging channel 10 feet deep to St. Marks River	75,000	Do.
Escambia:		
Drainage:		
Alabama portion of basin: Drainage for malarial mosquito control	328,000	Plans incomplete. Further study necessary. Should await completion of study project.
Florida portion of basin: Drainage for malarial mosquito control	146,000	Do.
Flood control:		
Caryville, Fla.: Flood-control improvements	139,000	Tentative plans ready.
Navigation:		
Pensacola Harbor, Fla.: Dredging channel and basin to provide refuge and repair basin for medium-sized vessels.	40,000	Surveys completed.

Southeast Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Mobile:		
Drainage:		
Dallas County, Ala.: Drainage for malaria control throughout the county	$113,000	Plans being prepared.
Dallas and Lamar Counties, Ala.: Drainage canal for malaria control and land reclamation	83,000	Plans completed.
Montgomery County, Ala.: Drainage for malaria control throughout the county	124,000	Plans being prepared.
Mobile County, Ala.: Drainage for malaria control, land reclamation, and channel improvement of Three Mile Creek near Mobile.	300,000	Plans completed.
Flood control:		
Northport, Tuscaloosa County, Ala.: Levees	100,000	Preliminary survey completed.
Itawamba County, Miss.: Straightening river channel on East Fork of Tombigbee River near Fulton for flood control.	109,000	Do.
Rome, Ga.: Levees for flood control	330,000	Plans being prepared. Cost includes pumping equipment and changes in bridges, street levels, railroads, etc. Authorized by Congress.
Pollution:		
Gadsden, Ala.: Sewer-system extensions	200,000	Plans completed.
Homewood, Ala.: Sewer-system extension	96,000	Do.
Water supply:		
Bessemer, Ala.: New waterworks system and supply	1,018,000	Do.
Gadsden, Ala.: Improvements to waterworks system	96,000	Do.
Talladega, Ala.: Dam and reservoir for water supply	74,000	Plans being prepared.

TENNESSEE VALLEY

A comprehensive program for control of water in the Tennessee River for navigation, flood control and incidental power development is now under way. The completion of the system of dams already planned by the Tennessee Valley Authority will provide effective regulation of the main river. An all-embracing plan for development involving tributary rivers is still under investigation. Individual improvements of water supply, waste disposal, and malaria control have been planned by the respective State boards of health.

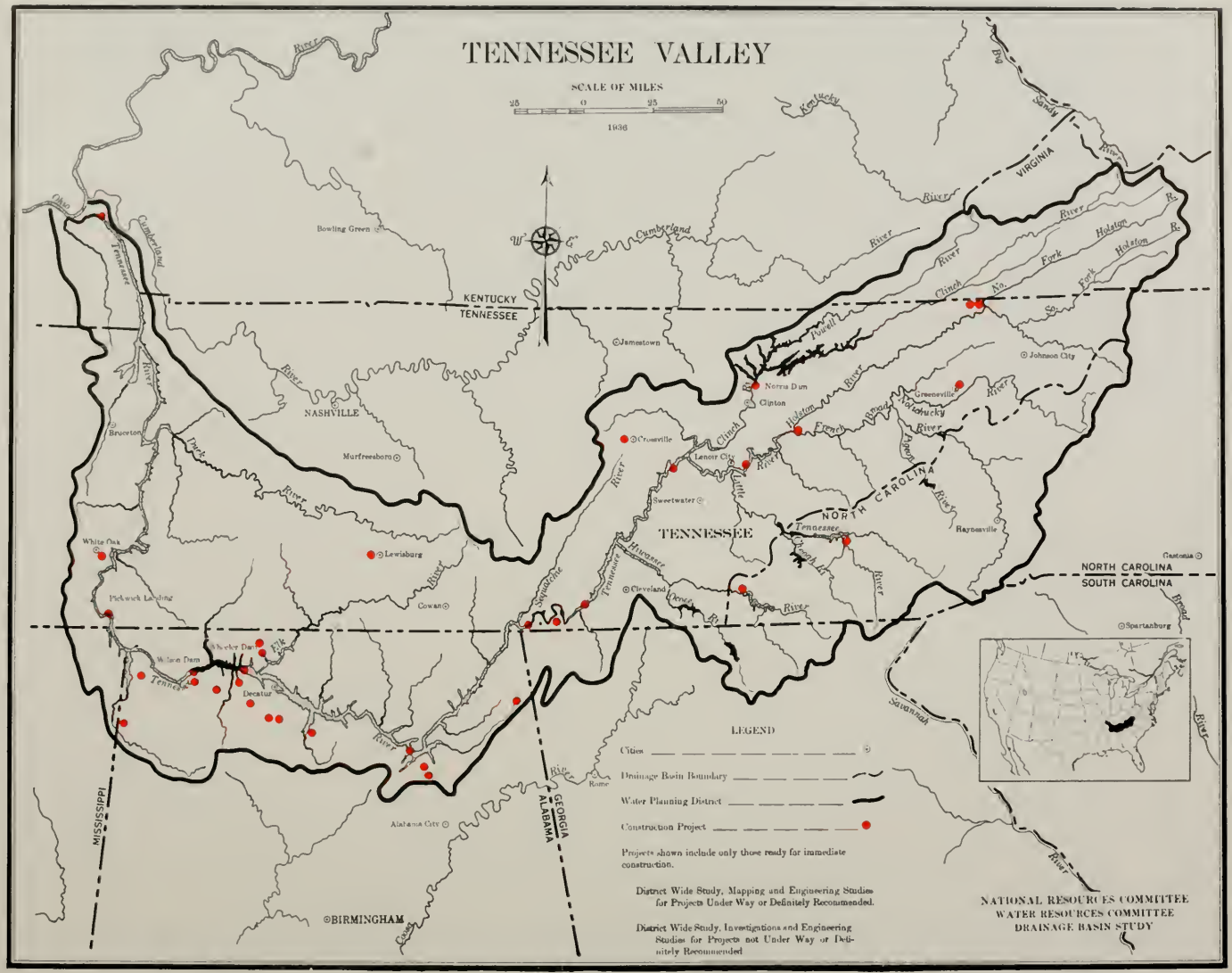
The annual rainfall and run-off in the Tennessee Basin are relatively heavy and their seasonal and annual distribution is highly irregular. The control of this irregular run-off according to an integrated plan for the purposes of navigation, flood control, and incidental power development is authorized in the Rivers and Harbors Act of 1930 and the T. V. A. Act as amended in 1935. Under these acts, the Tennessee Valley Authority has developed a program for the maintenance of a 9-foot navigable channel on the Tennessee River from Knoxville, Tenn., to its mouth, for the control of destructive floods in the Tennessee Valley and for reduction of flood crests along the lower Mississippi. In 1933, the pools behind Wilson Dam and Hales Bar Dam (a privately owned power development) provided the only 9-foot navigation facilities in the river. In order to complete the navigation project, the Authority has constructed, or has under construction, the Pickwick Landing Dam, Guntersville Dam, Chickamauga Dam, and the Wheeler Dam; each of them equipped with locks. There remain approximately 184 miles of lower and 120 miles of upper river which are unimproved. To meet these needs, locks and dams at Gilbertsville, Watts Bar, and Coulter Shoals are proposed as shown upon the accompanying map. The main stream structures are being supplemented by the construction of two dams on tributaries; the Norris Dam on the Clinch River and the Hiwassee Dam on the Hiwassee River. These will create tributary storage reservoirs which will be used to increase low-water flows and decrease flood flows reaching the main stream. A third tributary storage dam, the Fontana Dam on the Little Tennessee River, is recommended. The integrated operation of both groups of structures will result in the maintenance of an improved waterway, control of floods at Chattanooga and other points in the main valley, reduction of flood heights in the lower Mississippi River, and the generation of a large quantity of power. Hydroelectric units with a total capacity of about 400,000 kilowatts have been or will be installed at Norris, Wheeler, Pickwick Landing, Guntersville, and Chickamauga Dams. An installation of 84,000 kilowatts had been made earlier at Wilson Dam. At all dams intake openings probably will be provided for new generating units which may be installed if needed.

The Tennessee Valley Authority is now preparing a plan for the operation of these works when completed, and in addition is investigating the need for improvements on tributary streams. A few of the streams in the eastern section of the basin have been utilized in part by private interests for hydroelectric power, but the possible utilization of the remaining streams has not been explored fully. It may be expected that as a result of investigations to be made, comprehensive plans on a smaller scale will be outlined for the French Broad, Holston, Clinch, Elk, and Duck Rivers and for each of the other tributaries.

In addition to the work in progress for the regulation of the major rivers in the valley, numerous improvements in the interest of public health are being planned and carried on in scattered municipalities and farming areas of the valley. New water-supply systems and enlargements of old systems are needed at the places shown in the accompanying list of projects. Although stream pollution is not now a critical problem along the Tennessee River and its major tributaries because of sufficient stream flow to dilute raw sewage, a few localities now require new facilities for collection, treatment, and disposal of sewage.

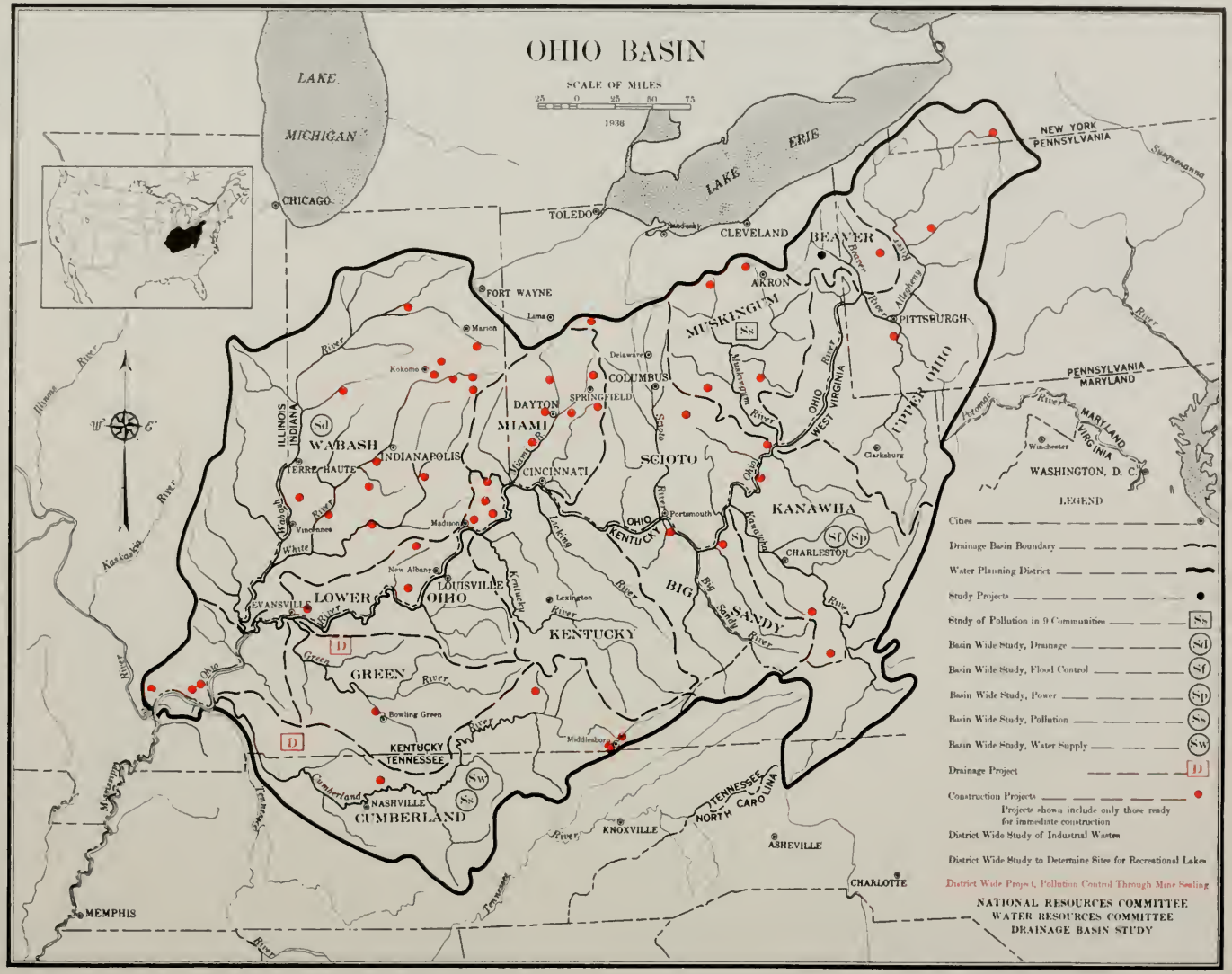
The work of land drainage for malaria control is now under the direction of the respective State departments of health, and is supplemented by malaria-control activities undertaken by the Tennessee Valley Authority in its reservoir areas.

Complementary to its river regulation activities, the Tennessee Valley Authority is engaged in basin-wide soil-erosion control, forestry, agricultural demonstration, power marketing, and land planning studies. In the light of these studies, programs for land use and for the generation and sale of power are being developed. The Tennessee basin is the only river basin in the United States in which continuous investigation of the use and control of water and of related problems is maintained by the Federal Government through the medium of a single administrative agency. The Authority's accomplishments point to the ultimate unified development of the Tennessee River. The method of attaining that end remains an experiment in governmental administration of water resources.


TENNESSEE VALLEY
SCALE OF MILES
25 0 25 50
1936
KENTUCKY
TENNESSEE
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
ALABAMA
MISSISSIPPI
NASHVILLE
Bowling Green
Jamestown
Bruceton
Murfreesboro
Lewisburg
Cowan
Pickwick Landing
White Oak
Wilson Dam
Wheeler Dam
Decatur
Alabama City
BIRMINGHAM
Cleveland
Sweetwater
Crossville
Lenoir City
Clinton
Norris Dam
Greeneville
Johnson City
Rockwood
Rayensville
Gastonia
Spartanburg
Rome
Cumberland
Tennessee
Ohio
Kentucky
Big Sandy
Clinch
Powell
Holston
French Broad
Pigeon
Nolichucky
Little Tennessee
Hiwassee
Ocoee
Watauga
Ocoee River
Savannah
Broad
Pascagoula
Tombigbee
Yazoo
Pearl
Black Warrior
Tallapoosa
Coosa
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Construction Project
Projects shown include only those ready for immediate construction.
District Wide Study, Mapping and Engineering Studies for Projects Under Way or Definitely Recommended.
District Wide Study, Investigations and Engineering Studies for Projects not Under Way or Definitely Recommended
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

Tennessee Valley Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Tennessee:		
General problems:		
Program of mapping, engineering studies, borings, and investigations needed for design in connection with construction projects now under way.	$2,100,000	
Program of mapping, engineering studies, borings and foundation studies, and preparation of preliminary plans in connection with construction projects already definitely recommended.	1,400,000	
Program of surveys, investigations, engineering studies, borings, and preparation of preliminary plans and estimates for additional projects on major tributary streams of the Tennessee River, including the French Broad, Holston, Clinch, Little Tennessee, Hiwassee, Sequatchie, Elk, and Duck Rivers.	500,000	Preferably to be done concurrently with projects now under way. Essential for extending comprehensive plan of development to tributary streams.
2. Construction Projects		
Tennessee:		
Flood control:		
Bristol, Washington County, Va.: Flood control, stream clearance, and retaining wall	20,000	Plans completed.
Flood control, navigation, and water power:		
Chickamauga Dam on Tennessee River: Construction for navigation, flood control, and incidental power development.	24,008,000	Work in progress. Cost given is for next 2 years. Additional needed to complete dam and initial appurtenances, $7,375,000.
Guntersville Dam on Tennessee River: Construction for navigation, flood control, and incidental power development.	23,697,000	Work in progress. Amount shown needed for completion of dam and initial appurtenances.
Hiwassee Dam on Hiwassee River: Construction for navigation, flood control, and incidental power development.	7,900,000	Work in progress. Cost given is for next 2 years. Additional needed to complete dam and initial appurtenances, $4,785,000.
Norris Dam on Clinch River: Construction for navigation, flood control, and incidental power development.	90,000	Work in progress. Amount shown needed for completion of dam and initial appurtenances, including two 50,000-kilowatt generating units.
Pickwick Landing Dam on Tennessee River: Construction for navigation, flood control, and incidental power development.	8,950,000	Work in progress. Amount shown needed for completion of dam and initial appurtenances, including two 36,000-kilowatt generating units.
Wheeler Dam on Tennessee River: Construction for navigation, flood control, and incidental power development.	3,856,000	Work in progress. Amount shown needed for completion of dam and initial appurtenances, including two 32,000 kilowatt generating units.
Pollution:		
Albertville, Marshall County, Ala.: Sewer system	95,000	Preliminary plans prepared.
Boaz, Marshall County, Ala.: Sewer system extension	49,000	Do.
Bristol, Sullivan County, Tenn.: Sewage collection and treatment	750,000	Do.
Greeneville, Greene County, Tenn.: Sewage treatment plant and new outlet	250,000	Do.
Hartselle, Morgan County, Ala.: Sewer system	56,000	Do.
Lewisburg, Marshall County, Tenn.: Sewage treatment plant additions	26,000	Do.
Moulton, Lawrence County, Ala.: Sewer system and sewage treatment plant	40,000	Do.
Red Bay, Franklin County, Ala.: Sewer system and sewage treatment plant	38,000	Do.
Water supply:		
Cherokee and Leighton, Colbert County; Rogersville, Lauderdale County; and Town Creek, Lawrence County, Ala.: Waterworks and waterworks improvements.	115,000	
Courtland, Lawrence County, Ala.: Waterworks	29,000	Plans prepared.
Crossville, Cumberland County, Tenn.: Water supply; new source, treatment, and extensions	78,000	Preliminary plans prepared.
Moulton, Lawrence County, Ala.: Waterworks improvements	31,000	Plans prepared.
Sheffield and Tuscumbia, Colbert County, Ala.: Waterworks	297,000	Preliminary plans prepared
GROUP B—FOR DEFERRED CONSTRUCTION		
Tennessee:		
Flood control, navigation, and water power:		
Fontana Dam on Little Tennessee River: Construction for navigation, flood control, and incidental power development.	$8,225,000	Cost given is for first 2 years. Additional needed to complete dam and initial appurtenances (preliminary estimate only), $20,775,000.
Gilbertsville Dam on Tennessee River: Construction for navigation, flood control, and incidental power development.	10,000,000	Cost given is for first 2 years. Additional needed to complete dam and initial appurtenances (preliminary estimate only), $68,756,000.
Watts Bar Dam on Tennessee River: Construction for navigation, flood control, and incidental power development.	7,280,000	Cost given is for first 2 years. Additional needed to complete dam and initial appurtenances (preliminary estimate only), $23,720,000.
Coulter Shoals Dam on Tennessee River: Construction for navigation, flood control, and incidental power development.	475,000	Cost given is for first 2 years. Additional needed to complete dam and initial appurtenances (preliminary estimate only), $19,525,000.
Drainage:		
Beech River, Decatur, and Henderson Counties, Tenn., and Knoxville, Knox County, Tenn.: Drainage and ditch lining for malaria control.	175,000	
Chattanooga, Hamilton County, Tenn.: Lining of ditches for malaria control	100,000	Plans completed.
White Oak, Hardin County, Tenn.: Drainage for malaria control	25,000	Plans completed. Work begun in 1934, but discontinued due to lack of funds.
Pollution:		
Athens, McMinn County, Tenn.: Sewer system including sewage treatment plant	150,000	
Bristol, Washington County, Va.: Sewers and sewage treatment plant	300,000	
Bruceton, Carroll County, Tenn.: Sewage treatment plant	47,000	Preliminary plans prepared.
Cleveland, Bradley County, Tenn.: Sewer system improvements	200,000	
Cowan, Franklin County, Tenn.: Sewer system improvements and sewage treatment plant	75,000	
Fayetteville, Lincoln County; Jefferson City, Jefferson County; Manchester, Coffee County; Mount Pleasant, Maury County; Shelbyville, Bedford County; South Pittsburg, Marion County; Tullahoma, Coffee County, Tenn.: Sewer extensions, sewage treatment, and collectiug plants; new installations and improvements.	618,000	
Hazelwood and Waynesville, Haywood County, N. C.: Sewage treatment plant	221,000	Do.
Johnson City, Washington County, Tenn.: Sewage treatment plant and new outfall sewer	350,000	
Sweetwater, Monroe County, Tenn.: Sewer system improvements and sewage treatment plant	50,000	
Water supply:		
Abingdon, Washington County, and Clintwood, Dickenson County, Va.; Englewood, McMinn County; Erwin, Unicoi County, Jasper, Marion County, Tullahoma, Coffee County; and Waverly, Humphreys County, Tenn.: Water supply systems, improvements, and extensions.	290,000	
Athens, McMinn County, Tenn.: Water system improvements	100,000	
Cleveland, Bradley County, Tenn.: Water supply, new source and treatment	200,000	
Lenoir City, Loudon County, Tenn.: Water treatment plant	50,000	
Sweetwater, Monroe County, Tenn.: Water supply, improvements and treatment	35,000	
Washington County Sanitary District, Virginia: Water supply system	478,000	Plans prepared and project ready to advertise, except for some legal and other difficulties.


OHIO BASIN
SCALE OF MILES
25 0 25 50 75
1936
LAKE MICHIGAN
LAKE ERIE
CHICAGO
TOLEDO
CLEVELAND
NEW YORK
PENNSYLVANIA
BEAVER
AKRON
MUSKINGUM
PITTSBURGH
FORT WAYNE
Lima
Marion
Kokomo
Delaware
COLUMBUS
SPRINGFIELD
DAYTON
MIAMI
WABASH
INDIANAPOLIS
TERRE HAUTE
CINCINNATI
SCIOTO
KANAWHA
CHARLESTON
Clarksburg
Portsmouth
Vincennes
Madison
New Albany
LOUISVILLE
EVANSVILLE
LOWER OHIO
Lexington
BIG SANDY
KENTUCKY
GREEN
Bowling Green
Middlesboro
KENTUCKY
TENNESSEE
NASHVILLE
CUMBERLAND
KNOXVILLE
TENNESSEE
NORTH CAROLINA
ASHEVILLE
CHARLOTTE
MEMPHIS
UPPER OHIO
PENNSYLVANIA
MARYLAND
MARYLAND
VIRGINIA
WASHINGTON, D. C.
Winchester
ILLINOIS
INDIANA
WEST VIRGINIA
OHIO
KENTUCKY
Sd
Ss
Sf
Sp
Sw
D
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Study Projects
Study of Pollution in 9 Communities
Basin Wide Study, Drainage
Basin Wide Study, Flood Control
Basin Wide Study, Power
Basin Wide Study, Pollution
Basin Wide Study, Water Supply
Drainage Project
Construction Projects
Projects shown include only those ready for immediate construction
District Wide Study of Industrial Wastes
District Wide Study to Determine Sites for Recreational Lakes
District Wide Project, Pollution Control Through Mine Sealing
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

OHIO BASIN
(Except the Tennessee Valley)

The Ohio River is a sewer, a source of water supply, an outlet for floods, and a highway. One-seventh of the population of the United States is concerned directly with the waters of the Ohio Basin, which present grave dangers and great opportunities.

The Ohio River system now furnishes the chief means of disposal for nearly all the waste products of the many communities that line its banks, and provides the water essential to the health of millions of people and to the operations of thousands of industrial plants. Pollution of the main river and some of its tributaries by untreated domestic sewage and industrial wastes is a constant and serious threat to public health. Acid drainage from mines complicates the problem. It is estimated that the sewage produced by 6,500,000 people drains to the Ohio River directly or through tributaries. Less than 30 percent of the sewage receives any treatment. On days of minimum flow, about one quart in every gallon of water in the main river at certain points has passed through a sewer system. This grossly polluted water after filtration is used as drinking water by 2,500,000 people. A determined attack on the pollution problem of the Ohio River system is imperative, and for that purpose various undertakings are included in the accompanying list of projects.

High floods have swept down the Ohio from time to time since the days of earliest settlement along its banks. It has contributed more than any other stream to the devastating floodwaters of the lower Mississippi. The unprecedented floods of March 1936 in parts of the upper basin focused public attention upon this problem and led to an insistent demand for remedial measures. A system of flood-control reservoirs on the tributaries would provide the most practical means of controlling the floods of the Ohio and its larger branches. Protection against major floods was provided years ago in the Miami drainage area and soon will be afforded in the Muskingum Basin by a system of reservoirs now under construction. A comprehensive plan developed by the Corps of Engineers includes some 89 reservoirs for flood control and power production. Many of the possible benefits in flood control could be obtained by building 39 of these reservoirs, about half of which are judged to be economically justified at this time. Fourteen were authorized by the Congress in the Flood Control Act of 1936. Despite the conflict between the need of reservoir space for storage of floodwaters and for storage of water for other purposes, the integrated use of a *system* of large reservoirs for control of floodwaters, for augmentation of low flow, for power development, for water supply, and for recreation is possible. A study of such possibilities in the Ohio Basin is recommended. Its water problems are complex and interrelated. In few drainage areas, if any, is there greater need or greater opportunity to solve water problems in combination, and to provide simultaneously for multiple uses of water.

The Ohio River and some of its tributaries, notably the Monongahela, carry the heaviest river traffic in the country. Further improvement of the Ohio, including replacement of obsolete dams, changes to facilitate operation of locks and dams, channel dredging, and the like, are recommended for immediate or deferred construction. The most ambitious scheme of recent years for the creation of a new commercial waterway within and near the Ohio Basin calls for a canal through the Beaver, Mahoning, and Grand Rivers to connect Lake Erie with the Ohio River at an estimated cost of some $165,000,000. The project is now being restudied by the Corps of Engineers. Because this study is incomplete, the project has not been considered for inclusion in the present plan.

Water recreational facilities are meager throughout the basin. Erosion is locally a serious problem, notably in the Muskingum drainage and in West Virginia.

Ohio Basin Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Ohio, general		
Flood control, low-water flow control, navigation, recreation, and water power:		
District-wide investigation to plan an integrated system of reservoirs for multiple use	$500,000	A continuation and expansion of previous surveys by the Corps of Engineers.
Pollution:		
Study of industrial wastes in Ohio Valley to determine points of most pollution, to devise means of handling industrial wastes, and to adopt a common policy in cooperation with industry in regard to corrective measures required.	1 50,000	
Recreation:		
Study to determine suitable sites for recreational lakes in relation to cost and accessibility to population.	50,000	Many proposed projects in need of classification
Beaver:		
Pollution:		
Study in the Youngstown district on the Mahoning River of low flow augmentation, sewage treatment, and industrial wastes, with consideration of flood control.	50,000	Preliminary investigation has been made.
Muskingum:		
Pollution:		
Study to determine economic justification for and to devise means of removing industrial waste pollution from plants at Canton, Mansfield, Barberton, Massillon, Zanesville, Newark, Coshocton, Rittman, and Cambridge, Ohio.	15,000	
Miami:		
Flood control, recreation, and wildlife:		
Study of proposed reservoir for recreational use and possible flood control on Little Miami River	5,000	
Wabash:		
Drainage:		
Study of drainage policy for Wabash Basin to determine whether additional land drainage is desirable, and whether some existing work should be abandoned.	25,000	A controversial question requiring thorough investigation.
Flood control:		
Study of flood protection for Indianapolis to determine what levees should be included and cost and benefit balance.	15,000	To include projects authorized by Congress.
Cumberland:		
Pollution:		
Pollution stream survey and laboratory tests to obtain adequate information of existing and potential pollution. Also hydrologic study.	200,000	Intensive 2-year program, followed by continuing annual work.
2. Construction Projects		
Ohio, general:		
Navigation:		
Dredging Ohio River to provide 500-foot width channel	2,000,000	Under construction. Cost given is for next 2 years. Additional needed to complete; $2,700,000.
Pollution:		
Aliquippa and Ambridge, Pa.; Ashland, Ky.; Baden and Beaver, Pa.; Bellaire, Ohio; Bellevue, Ky.; Benwood, W. Va.; Bridgeport, Ohio; Catlettsburg, Ky.; Chester, W. Va.; Cincinnati, Ohio and vicinity; Covington and vicinity and Dayton, Ky.; East Liverpool, Ohio; Evansville, Ind.; Follansbee, W. Va.; Freedom, Pa.; Gallipolis, Ohio; Henderson, Ky.; Hollidays Cove, W. Va.; Hopewell Township, Pa.; Huntington, W. Va.; Ironton, Ohio; Jeffersonville, Ind.; Louisville and Ludlow, Ky.; Madison, Ind.; Marietta and Martins Ferry, Ohio; Maysville, Ky.; McMechen, W. Va.; Metropolis, Ill.; Middleport, Ohio; Midland, Pa.; Mingo Junction, Ohio; Monaca, Pa.; Mount Vernon, Ind.; Moundsville, W. Va.; New Albany, Ind.; New Boston, Ohio; New Martinsville, W. Va.; Newport, Ky., and vicinity; Norwood, Ohio, and vicinity; Owensboro and Paducah, Ky.; Parkersburg, W. Va.; Pittsburgh, Pa.; Pomeroy and Portsmouth, Ohio; Sistersville, W. Va.; Steubenville, Ohio; Tell City, Ind.; Toronto, Ohio; Wellsburgh, W. Va.; Wellsville, Ohio; Wheeling and Weirton, W. Va.: Collecting sewers and one or more primary sewage treatment plants at each place to clean up the Ohio River, safeguard water supplies and provide water recreation.	75,000,000	Will probably require concerted action by States and communities. Estimate is highly approximate. Includes cost of surveys which should be undertaken prior to construction.
Ohio Basin, general: Sealing of abandoned mines to protect public water supplies, to reduce acid in streams which injures concrete and metal structures, boats, and piping, and aggravates pollution.	7,000,000	Program now under way.
Upper Ohio:		
Pollution:		
Knox, Pa., and Mifflin Township, Pa.: Sewage treatment plant for reduction of nuisance; and sewer system for Mifflin Township, Pa.	280,000	Plans completed.
Beaver:		
Pollution:		
Girard, Niles, Warren, and Youngstown (including Campbell), Ohio: Primary sewage treatment plants and collecting sewers to lessen unsanitary conditions and pollution in Mahoning and Beaver Rivers and to improve quality of industrial water taken from them.	8,000,000	Plans required to be in conformity with the study recommended under group A.
Unesville and Slippery Rock, Pa.: New sewage treatment plant to protect Pymatuning reservoir at the former place; at latter place, additional units to existing sewage treatment plants.	40,000	Plans completed.
Muskingum:		
Pollution:		
Ashland, Barberton, Buckeye Lake, and Cambridge, Ohio: Sewer systems and complete treatment plants.	2,200,000	General plans ready for Cambridge, detailed plans for other communities.
Scioto.		
Pollution:		
Keoton, Ohio: Improvements to existing sewage plant which discharges into stream above Columbus water reservoirs.	40,000	Investigation and preliminary plans made.
Lancaster, Ohio: Sewage treatment plant	400,000	Do.
Miami:		
Pollution:		
Dayton, Ohio: Construction of 10 additional sprinkling filters for sewage plant	150,000	Plans made in connection with present improvements.
Hamilton, Ohio: Intercepting sewers and treatment plant construction; plans to include control of industrial pollution.	1,000,000	Final plans needed.
South Charleston, Ohio: Complete sewage treatment plant	40,000	General plans ready.
Yellow Springs, Ohio: Complete sewage treatment plant	50,000	General plans made.
Recreation and wildlife:		
Piqua, Ohio: Dam to provide cooling water for power plant and recreation lake for city	55,000	There are preliminary plans. Final plans now being made.
Water supply:		
Springfield, Ohio: Increased water supply	800,000	

1 For first year.

Ohio Basin Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Wabash:		
Pollution:		
Anderson, Muncie, Newcastle, and Noblesville, Ind.: Sewage treatment plants	$3,000,000	Plans ready; need imperative
Crawfordsville, Edinburg, Elwood, and Martinsville, Ind.: Sewage treatment plants	650,000	Do.
Hartford City, Ind.: Correction of excessive pollution from domestic sewage and large paper mills	180,000	Do.
Mitchell and Peru, Ind.: Sewer systems and sewage treatment plants	675,000	Plans ready.
Water supply:		
Bloomington, Carlisle, and Elnora, Ind.: Water supply systems	200,000	Do.
Green:		
Drainage:		
Daviess, Henderson, Hopkins, McLean, Muhlenburg, Ohio; Todd and Webster Counties, Ky.: Drainage to exterminate mosquitoes and control malaria with incidental benefits to farm land.	960,000	A 6-year program now being started.
Water supply:		
Bowling Green, Ky.: Covering of water distribution reservoirs to safeguard water supply against contamination.	44,000	Plans completed.
Cumberland:		
Drainage:		
Caldwell, Christian, Livingston, Lyon, Todd, and Trigg Counties, Ky.: Drainage to exterminate mosquitoes and control malaria with incidental benefits.	288,000	A 6-year program now being started.
Flood control:		
Middlesboro, Ky.: Construction of levees to protect property from floods	600,000	Preliminary study and plans completed. Detail plans needed.
Pollution:		
Gallatin, Tenn.: Sewers and sewage treatment plant	150,000	Preliminary plans ready.
Middlesboro, Ky.: New sewer system for large population without sewers	120,000	Plans ready; need urgent.
Somerset, Ky.: Sewer system and sewage treatment plant	200,000	Do.
Lower Ohio:		
Drainage:		
Ballard, Crittenden, Daviess, Henderson, Hopkins, Livingston, McCracken, Union, and Webster Counties, Ky.: Drainage to exterminate mosquitoes and control malaria with incidental benefits to farm land.	640,000	A 6-year program now being started.
Pollution:		
Batesville, Ind.: Interceptors and complete sewage treatment plant	180,000	Preliminary plans completed.
Corydon and Salem, Ind.: Complete sewage treatment plants	200,000	Plans completed.
Water supply:		
Madison, Milan, and Vevay, Ind.: Chlorination, water plant improvements, and/or filtration plants.	150,000	Preliminary plans completed.
GROUP B—FOR DEFERRED CONSTRUCTION		
Ohio general:		
Flood control:		
Ohio River flood control project, including construction of 14 reservoirs as follows: Allegheny, Tionesta, Crooked Creek, French Creek, Conemaugh River, Loyalhanna, Mahoning Creek, Red Bank Creek, West Fork River, Clendenin, Big Bend, Bluestone, Falmouth, and Cave Run Reservoirs.	$85,350,000	The preliminary estimates given will be revised as a result of study project now in progress. Authorized by Congress.
Navigation:		
At Ohio dams nos. 43, 39, 30, 27, and 21: Construction of additional bear trap capacity to facilitate operation of dams and maintain pool levels for navigation.	1,300,000	Plans prepared.
At Ohio dams nos. 18, 47, 51, 52, and 53: Raise each dam 2 feet to reduce dredging costs	900,000	Preliminary plans ready.
Reconstruct dam no. 48 to raise pool 2 feet and facilitate operation	3,000,000	Do.
Upper Ohio:		
Pollution:		
Accident, Md.; Glenfield, Pa.; Mountain Lake Park, Md.; North Apollo, Pa.; St. Clairsville and Stowe Township, Ohio: Sewer systems for public health and convenience.	500,000	Preliminary plans for North Apollo, survey for Olenfield. Others—no plans available.
Arnold, Canonsburg, Connellsville, and Donora, Pa.; Friendsville, Md.; Greensburg, Huston, Johnstown, Mount Pleasant, Nanty Glo, New Kensington, and Waynesburg, Pa.; and Woodsfield, Ohio: Intercepting sewer and sewage treatment plants.	3,000,000	Plans partly completed for Greensburg and Connellsville (which includes pumping stations). Others—no plans available.
Bradford, Coudersport, East Brady, Edinboro, Emlenton, Ford City, Franklin, Homer City, Johnsonburg, Kane, Kittanning, Mount Jewett, Oil City, Port Allegany, Polk State School, Ridgway, St. Marys, Sheffield Township, Smethport, Tidioute, Tionesta, Warren, and Youngsville, Pa.: Primary sewage treatment plant and intercepting sewer to clean up the Allegheny River.	3,000,000	Preliminary plans for Coudersport, Sheffield Township, Emlenton, and East Brady. Plans partly completed for Smethport, Bradford, Warren, Franklin, and Kittanning. Plans completed for Edinboro, Tidioute, Oil City, and Polk State School. Others—no plans available.
Clarksburg, 4-H Camp, and Weston, W. Va.: Sewage treatment plants	860,000	
East McKeesport and Latrobe, Pa.: Interceptor sewers	270,000	No plans available.
Irwin, Marianna, and Oakdale, Pa.: Sewage treatment plants	100,000	Do.
Salamanca, N. Y.: Collecting sewers and sewage treatment plant to clean up the Allegheny River	310,000	Preliminary plans made.
Water supply:		
Bentleyville, Bradfordwoods, Brookville, and Daisytown, Pa., and Marietta, Ohio: Water filtration plant to produce better water supply.	415,000	Contract awarded at Daisytown. Plan completed for Brookville. Study completed for Bentleyville. No plans available for Bradfordwoods and Marietta.
Carmichaels and Salisbury, Pa.: Complete new water supply systems	150,000	Plans ready.
Clarksburg, 4-H Camp, and Weston, W. Va.: Reservoir for joint water supply	800,000	No plans available.
Beaver:		
Pollution:		
Butler Township, Jackson Township, New Brighton, North Bessemer, Rochester Township, Sharon, South New Castle, Union Township, West Middlesex, and White Township, Pa.: Community-wide sewer systems.	800,000	Plans are complete for White Township, Union Township, South New Castle, and Jackson Township; partly complete for West Middlesex and North Bessemer. Others have no plans.
Water supply:		
Beaver, Harrisville, and Slippery Rock, Pa.: Water softening plants at Beaver and Slippery Rock; water system at Harrisville.	150,000	Harrisville plans completed. Others—preliminary plans.
Muskingum:		
Pollution:		
Coshocton, Crooksville, Dennison, Newark, and Uhrichsville, Ohio: Sewer systems and sewage treatment plants.	1,400,000	General plans for Coshocton; all other places no plans available. Probably combined plant for Dennison and Uhrichsville.
Dover, Minerva, New Philadelphia, and Wooster, Ohio: Sewage treatment plants or secondary treatment plant to supplement existing plants.	600,000	Plans needed.
Malta, McConnelsville, Mount Vernon, Rittman, and Zanesville, Ohio: Sewage treatment plants	825,000	Existing Rittman plant subject to overflows by floods.
Water supply:		
Mansfield, Ohio: Increased water supply	700,000	Inadequate industrial supply.

Ohio Basin Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Kanawha:		
Pollution:		
Beckley, W. Va.: Sewage treatment plant	$200,000	Plans needed.
Princeton, W. Va.: Sewage treatment plant	125,000	Do.
Scioto:		
Pollution:		
Circleville, Hillsboro, and Wellston, Ohio: Sewage treatment plants	360,000	Investigation and plans are lacking.
Big Sandy:		
Pollution:		
Williamson, W. Va.: Sewage treatment plant	125,000	No plans available.
Water supply:		
Elkhorn City, Fullerton, and Raceland, Ky.: New water supply systems	250,000	Preliminary plans completed.
Miami:		
Pollution:		
Germantown, Ohio: New sewage treatment plant	130,000	Preliminary plans made.
Middletown, Ohio: Sewage treatment plant and relief sewers	1,000,000	Plans and surveys needed for both domestic and industrial sewage treatment works.
Piqua, Ohio: Primary sewage treatment plant	300,000	Plans needed.
Urbana, Ohio: Reconstruction and extension of sewage treatment plant	35,000	Do.
Water supply:		
Deffiaff, Ohio: Municipal waterworks, wells, pumps, distribution system	70,000	Preliminary plans.
Kentucky:		
Pollution:		
Georgetown, Hazard, Irvine, Mount Sterling, Nicholasville, Paris, and Versailles, Ky.: Sewage treatment plants and/or outfall sewers and/or sewer systems.	600,000	Plans partly completed for Hazard; elsewhere plans have not been prepared.
Water supply:		
Richmond, Ky.: Filter plant to purify supply from stream of poor quality	120,000	Plans ready.
Wabash:		
Pollution:		
Altamont, Newton, and Paxton, Ill.: Sewer systems and complete sewage treatment plants	500,000	Plans needed.
Brazil, Ind.: Secondary sewage treatment	100,000	Plans not yet ready.
Casey, Charleston, Fairfield, Georgetown, Greenup, Hoopeston, Marshall, Mattoon, Palestine, Paris, and Olney, Ill.: Complete sewage treatment plants and collecting sewers in some cases to remove nuisance conditions, prevent suits and improve water for agricultural purposes.	1,800,000	Plans needed.
Delphi, Logansport, Marion, and West Terre Haute, Ind.: Sewer systems and sewage treatment plants.	1,300,000	Plans not ready.
Terre Haute, Ind.: Sewage treatment plant, including some sewers to correct excessive river pollution and remove menace to water supplies of cities downstream, including Vincennes.	2,300,000	Do.
Water supply:		
Hazelton and Oakland City, Ind.: Water purification plants	75,000	Do.
Jasonville, Ind.: Water supply	350,000	Do.
Logansport, Ind.: Water purification plant improvements	30,000	Do.
Green:		
Pollution:		
Campbellsville, Ky.: Sewer system and sewage treatment plant	150,000	Preliminary plans and specifications completed
Water supply:		
Auburn, Brownsville, Cave City, Hartford, Island, Leitchfield, and Munfordville, Ky.: Water supply for communities now depending on individual supplies.	410,000	Cave City, Hartford, Island, and Leitchfield plans ready; other places, no plans available.
Cumberland:		
Pollution:		
Hopkinsville, Ky.: Major extension of sewer system and addition of sewage treatment plant	425,000	Plans completed.
Princeton, Ky.: Sewage plant for complete treatment of sewage	60,000	Preliminary plans ready.
Williamsburg, Ky.: Sewage treatment plant	100,000	Do.
Water supply:		
Albany, Burnside, Evarts, Livingston, and Whitley, Ky.: Water supply systems	500,000	No plans available.
Baxter, Erin, and Smyrna, Tenn.: Water supply systems	135,000	Preliminary plans ready.
Lower Ohio:		
Pollution:		
Lawrenceburg, Ky.: Sewer system	120,000	Preliminary plans completed.
Water supply:		
Corydon, Dixon, Lewisport, and West Point, Ky.: Water supply systems	250,000	Preliminary plans completed.
Versailles, Ind.: Water supply, wells, pumps, tank, and distribution system	60,000	No plans available.

The economic growth of the Great Lakes drainage area has hinged in large measure upon the utilization of the lakes system as a waterway. The St. Lawrence River link to the Atlantic Ocean now is the outstanding waterway project in the district, and most other proposed large improvements, other than pollution-control works, are related directly or indirectly to it.

Under the terms of a pending treaty with Canada, the St. Lawrence River would be provided with a navigable channel of 27 feet, thus allowing many ocean-going vessels free access to the Great Lakes. Locks and dams would be constructed on the St. Lawrence River, and the connecting channels between the Great Lakes would be deepened. Hydroelectric plants in the international section with an installed capacity of 1,640,000 kilowatts would be constructed in connection with the navigation works. The estimated cost of the project to the United States is $265,000,000, assuming a two-step development. This plan of development is the basis of the pending international agreement. This project may be undertaken as soon as the necessary treaty with Canada is ratified.

Compensating works on the Niagara and St. Clair Rivers which would operate to restore and maintain lake levels on Lake Erie, Lake Huron, and Lake Michigan, respectively, should be constructed.

The scenic value of Niagara Falls is now impaired by occasional low-water flows. Remedial works on the Niagara River above the falls accordingly have been designed by the International Niagara Board of Control. No further diversions of water for power above the falls should be allowed until the efficiency of these works has been tested in practice.

Throughout the Great Lakes area maintenance of lake levels—primarily for navigation—and of scenic features, such as waterfalls, is of the utmost importance to the rapidly growing recreational industry. In the Superior Lake drainages of Minnesota and Wisconsin, and in the Adirondacks, as well as in international waters, the preservation of natural-water bodies is a critical problem.

Flood protection in the short and relatively flat streams which drain into Lakes Michigan, Huron, and Erie may be planned with little reference to conditions in the lakes themselves. In the basins of the Black, Genesee, Racquette, Lake Champlain, and other drainages into Lake Ontario and the St. Lawrence, there are numerous opportunities for combination of flood-control and low-water control reservoirs with hydroelectric power developments. A few multiple-use reservoirs in the rugged uplands of northern New York are recommended for deferred construction. Many others would generate power that would have value chiefly for supplying peak loads to supplement the St. Lawrence plants, and their initiation should await construction of the St. Lawrence project. Thus, plans for integrated regulation of the eastern tributaries of the lakes depend in considerable part upon plans finally adopted for the major waterway project.

Lake traffic has been a primary factor contributing to the growth of the Great Lakes cities. The lakes now carry more than 100 million tons of traffic a year, principally grain, iron ore, coal, and oil. In recent years, traffic has concentrated more and more in a few ports such as Duluth, Milwaukee, Chicago, Detroit, Cleveland, and Buffalo. For that reason the need for additional harbor improvements at the many smaller ports is slight, although operations involving greater depth and more room are justified at the larger ports.

The metropolitan areas on the shores of the Great Lakes have drawn freely upon the lakes for water supply. They also have dumped waste into the lakes indiscriminately. Chicago is now completing its great sewage-disposal plant, but the adjacent manufactural towns in Indiana have continued to contaminate the lake waters with sewage and industrial waste. The raw sewage from the northern Indiana cities should be treated, and provisions should be made against discharge of the effluent into the lake during flood periods on the Calumet River. Waters also are unduly polluted by sewage at Duluth and Detroit. At those points, as well as at the southern tip of Lake Michigan, sewage-treatment plants are necessary for the maintenance of satisfactory public-health conditions. Plans for appropriate works are ready in most cases, and construction should begin promptly. Sewage-treatment plants also are in demand in the densely populated valleys tributary to Lake Ontario, and in the Lake Champlain and St. Lawrence areas where recreational use of water is dominant. In addition, filtration and water-treatment plants are required at a few of the above-mentioned cities, and at Chicago, Duluth, Akron, and Cleveland extensions of the water-supply systems are warranted by growth in demand for water.

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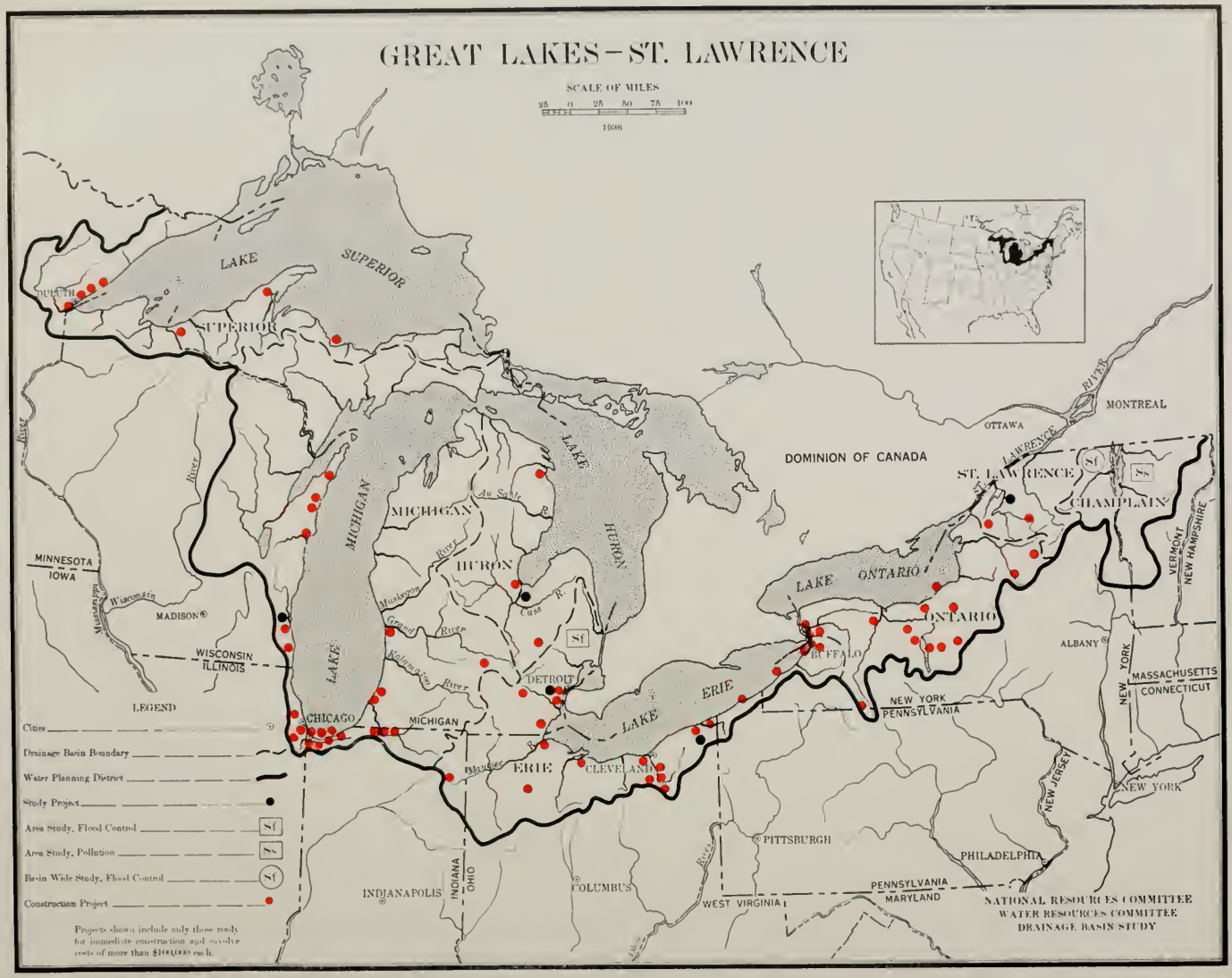

GREAT LAKES – ST. LAWRENCE
SCALE OF MILES
1936
LAKE SUPERIOR
DULUTH
SUPERIOR
MINNESOTA
IOWA
MADISON
WISCONSIN
ILLINOIS
LAKE MICHIGAN
CHICAGO
MICHIGAN
LAKE HURON
Au Sable R.
Saginaw River
Grand River
Kalamazoo River
Cass R.
DETROIT
St.
LAKE ERIE
Maumee R.
CLEVELAND
BUFFALO
LAKE ONTARIO
ONTARIO
DOMINION OF CANADA
OTTAWA
MONTREAL
ST. LAWRENCE
St.
St.
CHAMPLAIN
VERMONT
NEW HAMPSHIRE
ALBANY
NEW YORK
MASSACHUSETTS
CONNECTICUT
NEW YORK
PENNSYLVANIA
NEW JERSEY
PHILADELPHIA
PITTSBURGH
PENNSYLVANIA
MARYLAND
WEST VIRGINIA
INDIANAPOLIS
INDIANA
OHIO
COLUMBUS
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Study Project
Area Study, Flood Control
Area Study, Pollution
Basin Wide Study, Flood Control
Construction Project
Projects shown include only those ready for immediate construction and involve costs of more than $100,000 each.
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

Great Lakes—St. Lawrence Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—PROJECTS FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Michigan:		
Flood control:		
Grand River, Mich.: Flood control	$40,000	With specific reference to Lansing and Grand Rapids.
Milwaukee River, Wis.: Flood control	5,000	
Huron:		
Flood control:		
Saginaw River and Sebewaing River: Flood-control studies	45,500	To determine flood hazards and best method and cost of abatement, with special reference to Saginaw, Bay City, Sebewaing River and Sebewaing village.
Pollution and water supply:		
Saginaw, Mich.: Water supply and industrial waste control or a new source of water supply	10,000	Preliminary studies have been undertaken.
Erie:		
Flood control:		
Clinton, Huron, Raisin, and Rouge Rivers, Michigan: Flood-control studies	5,000	
Navigation:		
Lake Erie-Ohio River Canal through Youngstown, Ohio, via Mahoning and Beaver Run	50,000	A study to extend the review now being made by the Corps of Engineers to provide consideration of alternate routes.
St. Lawrence:		
Flood control:		
Indian River Branch of Oswegatchie River, N. Y.: Stream regulation	25,000	
Champlain:		
Flood control:		
New York: Flood control	15,000	
Vermont: Flood control	15,000	
Pollution:		
Vermont: Stream pollution and economic usefulness of remedial measures	25,000	
2. Construction Projects		
Superior:		
Navigation:		
Keweenaw waterway, Mich.: Deepen waterway to 25 feet	1,985,000	Under construction. Sum needed to complete.
Presque Isle, Mich.: Deepen harbor, supplemented by breakwater	350,000	Sum needed to complete. Authorized by Congress. Plans completed.
Pollution:		
Aurora, Minn.: Sewers	61,000	
Duluth, Minn.: Sanitary sewers	26,000	
Duluth, Minn.: Sewage treatment plant	1,166,000	Ready for construction.
Duluth, Minn.: Storm sewers	194,000	Plans completed.
Floodwood, Minn.: Sewers	24,000	
Hibbing, Minn.: Sewers	14,000	
Nopeming, Minn.: Sewage treatment plant	27,000	Do.
Virginia, Minn.: Sewers	7,000	
Water supply:		
Bessemer, Mich.: Additional water supply	124,000	Do.
Duluth, Minn.: Reservoir for water supply	161,000	Ready for construction.
Two Harbors, Minn.: Waterworks	111,000	Plans completed.
Michigan:		
Navigation:		
Calumet Harbor, Ind.: Breakwater construction and dredging	890,000	Under construction. Cost given is for next 2 years. Additional needed to complete: $1,735,000. Authorized by Congress.
Cook County, Ill.: Channel improvement	1,240,000	
Indiana Harbor, Ind.: Widening and deepening Indiana Harbor Canal	240,000	Cost given is for first 2 years. Additional needed to complete: $493,500. Authorized by Congress.
Kewaunee Harbor, Wis.: Deepening to 20 and 22 feet	60,000	Cost given is for first 2 years. Additional needed to complete, $224,000. Authorized by Congress.
Manistee Harbor, Mich.: Dredging to 21 feet and 23 feet	60,000	Authorized by Congress.
Manitowoc Harbor, Wis.: Dredging to 21 feet	115,000	
Manitowoc Harbor, Wis.: Deepen and widen channel in harbor	77,000	Cost given is for first 2 years. Additional needed to complete, $68,000. Authorized by Congress.
Menominee River and Harbor, Michigan and Wisconsin: Deepening to 21 feet	83,000	Authorized by Congress.
Milwaukee Harbor, Wis.: Deepening to 21 feet	50,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $75,000. Authorized by Congress.
Muskegon Harbor, Mich.: Repair revetment	28,000	Authorized by Congress.
St. Joseph, Mich.: Improving harbor	75,000	
Sheboygan Harbor, Wis.: Deepen and widen entrance channel	45,000	
South Haven, Mich.: Deepening to 21 feet	25,000	Cost given is for first 2 years. Additional needed to complete, $32,000.
Sturgeon Bay and Lake Michigan: Wisconsin ship canal, deepen and widen	1,125,000	Cost given is for first 2 years. Additional needed to complete, $250,000.
Two Rivers Harbor, Wis.: Deepen channel and inner basin	30,000	
Pollution:		
Benton Harbor, Mich.: Additional sewage treatment	180,000	Preliminary reports made.
Chicago Sanitary District, Ill.: Completion of sewage treatment construction program	40,940,000	Under construction. Work pursuant to Supreme Court decree.
Crown Point, Ind.: Sewage treatment plant	45,000	
East Chicago, Ind.: Interceptors and sewage treatment plant	1,330,000	
East Gary, Ind.: Sewers and sewage treatment plant	60,000	
Elkhart, Ind.: Interceptors and sewage treatment plant	1,000,000	
Gary, Ind.: Interceptors and sewage treatment plant	2,300,000	
Grand Haven, Mich.: Interceptors and sewage treatment plant	200,000	Plans completed.
Griffith, Ind.: Sewers and sewage treatment plant	29,000	
Hammond, Ind.: Interceptors and sewage treatment plant	2,950,000	
Highland, Ind.: Sewers and sewage treatment plant	30,000	
Hobart, Ind.: Interceptors and sewage treatment plant	90,000	
Kendallville, Ind.: Interceptors and sewage treatment plant	70,000	
Lansing, Mich.: Sewage treatment plant	900,000	Plans being made.
Michigan City, Ind.: Additions to sewers and sewage treatment plant	145,000	
Mishawaka, Ind.: Interceptors and sewage treatment plant	974,000	
Omro, Wis.: Sewer system and primary sewage-treatment plant	75,000	
Racine, Wis.: Primary sewage-treatment plant	450,000	
St. Joseph, Mich.: Additional sewage-treatment plant	200,000	Preliminary reports made.
Sheboygan Falls, Wis.: Complete sewage-treatment plant	73,000	Plans completed.
South Bend, Ind.: Interceptors and sewage treatment plant	3,000,000	
South Milwaukee, Wis.: Primary sewage-treatment plant	66,000	Do.
Valparaiso, Ind.: Interceptors and sewage-treatment plant	125,000	To prevent pollution of Lake Michigan.
Whiting, Ind.: Interceptors and sewage-treatment plant	335,000	

Great Lakes—St. Lawrence Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Michigan—Continued.		
Water supply:		
Chicago, Ill.: Filtration and metering project	$20,392,000	
Huron:		
Water supply:		
Bay City, Mich.: Water supply or treatment	73,000	Plans completed.
Davison, Mich.: Water supply or treatment	50,000	Do.
Flint, Mich.: Water-softening plant	500,000	Plans being prepared.
St. Charles, Mich.: Water supply or treatment	25,000	Plans completed.
Erie.		
Flood control:		
Cuyahoga River, Ohio: Dam for flood control	173,000	Approved by Congress.
Cuyahoga River, Ohio: Flood control reservoir	749,000	
Navigation:		
Ashtabula Harbor, Ohio: Deepening channels and constructing breakwater, additions, etc	360,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $508,000. Authorized by Congress.
Black Rock Channel and Tonawanda Harbor, N. Y.: Deepening and widening channels	225,000	Authorized by Congress.
Buffalo Harbor, N. Y.: Construction of breakwater and deepening channels	1,081,000	Authorized by Congress. Sum needed to complete.
Conneaut Harbor, Ohio: Deepening harbor	1,104,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $113,000. Authorized by Congress.
Erie Harbor, Pa.: Deepening channels to 21 and 25 feet	375,000	Cost given is for first 2 years. Additional needed to complete, $289,000. Authorized by Congress.
Lorain Harbor, Ohio: Deepening channels to 25 and 26 feet and widening 2 river bends	950,000	Authorized by Congress. Sum needed to complete.
Rouge River, Mich.: Deepening channels to 18, 21, and 25 feet	228,000	Sum needed to complete. Authorized by Congress. Partly completed.
Pollution:		
Akron, Ohio: Sanitary sewers	164,000	Plans completed.
Bedford, Ohio: Sewage-treatment plant	156,000	Do.
Erie, Pa.: Sanitary and storm sewers	787,000	Ready for construction.
Findlay, Ohio: Secondary sewage-treatment plant	212,000	
Fort Wayne, Ind.: Interceptors and sewage-treatment plant	5,000,000	Plans prepared.
Girard, Pa.: Secondary sewage-treatment plant	20,000	Ready for construction.
Wayne County, Mich.: 2 sewage-treatment plants	4,000,000	Plans completed.
Water supply:		
Akron, Ohio: Reservoir	454,000	
Albion, Pa.: Water mains	10,000	Do.
Ann Arbor and Waterford, Mich.: Water supplies	518,000	Do.
Bradner, Ohio: Water-supply system	45,000	Do.
Erie, Pa.: Water main to Presque Isle	50,000	Do.
Garfield Heights, Ohio: Water-supply system	44,000	Do.
Hamburg, N. Y.: Water-supply reservoir	122,000	Plans under way.
Lakewood, Ohio: Waterworks	1,629,000	Plans completed.
Toledo, Ohio: Water supply from Lake Erie	7,654,000	Do.
Ontario:		
Navigation:		
New York Barge Canal: Deepening of Oswego-Rome-Albany section to 14 feet		Work now under way. See Hudson River Basin, North Atlantic.
Pollution:		
Baldwinsville, N. Y.: Sewage-treatment plant	215,000	Plans completed.
Boonville, N. Y.: Sewage-treatment plant	97,000	Do.
Palmyra, N. Y.: Sewage-treatment plant and sewer system	194,000	Do.
Wellsville, N. Y.: Sewage-treatment plant	350,000	Authorized by village.
Water supply:		
Deferiet, N. Y.: New water supply	42,000	Present supply bad.
Dresden, N. Y.: New water supply system	54,000	
Madison Barracks, N. Y.: Water supply	85,000	Plans completed.
Odessa, N. Y.: New water supply system	70,000	Plans not approved.
Seneca Falls, N. Y.: Relocating water intake	100,000	
Union Springs, N. Y.: Water supply and sewer system	150,000	Plans completed.
St. Lawrence:		
Pollution and water supply.		
Norfolk, N. Y.: Water supply and sewer system	119,000	
Water supply:		
Evans Mills, N. Y.: New well and water supply system	60,000	
Champlain:		
Flood control:		
Proctor, Vt.: Channel improvement on Otter Creek	23,000	Authorized by Congress.
Johnson, Vt., and other points on Lamoille River: Channel improvement, bank revetment, and flood gates.	66,000	Do.
GROUP B—FOR DEFERRED CONSTRUCTION		
Superior		
Pollution:		
Ashland, Bayfield, Hurley, Mellen, Montreal, and Ponce, Wis.; Sault Ste. Marie, Mich.; Superior, and Washburn, Wis.: Sewage-treatment plants.	$1,105,000	
Calumet, Houghton, Ironwood, L'Anse, Marquette, Munising, Newberry, Ontonagon, and Wakefield, Mich.: Sewers and sewage treatment plants.	1,050,000	
Water supply:		
Hurley, Mellen, and Washburn, Wis.: Water supply systems	85,000	
Michigan:		
Flood control:		
Fond du Lac County, Wis.: Reservoir dams, etc	186,000	Flood control on east and west branches of Fond du Lac River.
Navigation:		
Frankfort Harbor, Mich.: Dredging to 18 feet	69,000	
Grand Calumet River, Ill.-Ind.: Extension of Illinois waterway system through Grand Calumet River to Gary.	500,000	
Grand Haven Harbor, Mich.: Dredging channel to 18 feet	25,000	Recommended by Chief of Engineers.
Green Bay, Wis.: Dredging turning basin 20 feet deep	27,000	Recommended by Rivers and Harbors Committee.
Indiana Harbor Canal, Ind.: Construction of a guard gate across the Indiana Harbor Canal where it joins the Grand Calumet River.	150,000	

Great Lakes—St. Lawrence Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Michigan—Continued.		
Pollution:		
Albion (2), Allegan, Bronson, Centerville, Constantine, Dowagiac, Eaton Rapids, Frankfort, Hart, Ionia, Kalkaska, Lake Odessa, Lawton, Manistee, Montague, Otsego, Three Rivers, Traverse City, White Cloud, and Zeeland, Mich.: Interceptors, sewers and sewage treatment plants.	$1,152,000	
Berlin, Chilton, Fond du Lac, Hortonville, Kimberly, Montello, New London, North Fond du Lac, Princeton, Sturgeon Bay, and Waupaca, Wis.: Sewage treatment plants.	696,000	
Big Rapids, Cassopolis, Coldwater, Coopersville, East Lansing, Fennville, Grand Ledge, Hartford, Marshall, Mason, Olivet, Plainwell, Portland-Sheridan, Saugatuck, Shelby, and Three Oaks, Mich.: Sewage treatment plants.	1,019,000	
Chestertown, La Grange, Ligonier, and Syracuse, Ind.: Interceptors, sewers, and sewage treatment plants.	287,000	
De Pere, Wis.: Interceptors, sewers, and sewage treatment plant	367,000	
Grand Rapids, Mich.: Sewage treatment plant	725,000	
Kalamazoo, Mich.: Sewage treatment plant	480,000	
Mackinac City, Mich.: Sewage-treatment plant	60,000	
Kenosha, Wis.: Sewage treatment plant	1,250,000	
Manitowoc, Wis.: Interceptors, sewers, and sewage treatment plant	690,000	
Milwaukee, Wis.: Sewage treatment plant	8,670,000	
Neenah, Wis.: Sewage treatment plant	227,000	
Niles, Mich.: Sewage treatment plant	370,000	
Port Washington and West Allis Wis.: Interceptors, sewers, and sewage treatment plants	397,000	
Sheboygan, Wis.: Sewage treatment plant	585,000	
Water supplies:		
Ashley, East Grand Rapids, Ludington, and Manistee, Mich.: Water supplies, additions, and improvements.	198,000	
Cudahy, Neenah, and Port Washington, and Two Rivers, Wis.: Water treatment plants	498,000	
De Pere, Oconto, and Sturtevant, Wis.: Water supplies, additions, and improvements	207,000	
Escanaba and Gladstone, Mich.: Water treatment plants	112,000	
Kenosha, Wis.: Water treatment plant	750,000	
Manitowoc, Wis.: Water treatment plant	482,000	
Marinette, Wis.: Water supply, additions, and improvements	210,000	
Milwaukee, Wis.: Water treatment plant	5,780,000	
Negaunee, Mich.: Water supply, additions, and improvements	240,000	
Racine, Wis.: Water treatment plant	1,000,000	
Sheboygan, Wis.: Water treatment plant	600,000	
Huron:		
Pollution:		
Alpena, Mich.: Sewage treatment plant	80,000	Plans not available.
Bay City, Mich.: Sewage treatment plant	850,000	Do.
Corunna, Fenton, Holly, Ithaca, Lapeer, Marlette, Montrose, St. Louis, and Vassar, Mich.: Sewage-treatment plants.	285,000	Plans completed for St. Louis. Preliminary plans completed for Vassar and Corunna. Plans not available for Fenton, Ithaca, Jolly, Marlette, and Montrose.
Flint, Mich.: New sewage treatment plant enlargement	285,000	
Grayling and Roscommon, Mich.: Sewage treatment plants	64,000	Roscommon: Preliminary plans completed. Grayling: Plans not available.
Saginaw, Mich.: Interceptors and sewage treatment plant	2,000,000	Preliminary estimate.
Sebewaing, and West Branch, Mich.: Sewage-treatment plants	80,000	Plans not available.
Erie:		
Drainage:		
Huron County, Ohio: Drainage improvement	30,000	Do.
Flood control:		
Cuyahoga County, Ohio: Creek improvement	47,000	Do.
Erie County, Pa.: Channel improvement	32,000	Do.
St. Marys River, Ohio: Clearing channel	192,000	Do.
Navigation:		
Black River, Mich.: Deepen channel to 20 feet	112,000	Authorized by Congress.
Erie County, N. Y.: Channel improvements, dredging, water diversion, and storage	445,000	Plans not available.
Fairport Harbor, Ohio: Deepening channels constructing hulkhead, and extending breakwater	462,000	Authorized by Congress.
Monroe Harbor, Mich.: Harbor improvement	233,000	
Pollution:		
Adrian, Blissfield, Chelsea, Mount Clemens, Royal Oak, Royal Oak Township, Ypsilanti, Mich.: Sewers and sewage treatment plants.	1,316,000	Plans not available.
Algonac, Applegate, Brown City, Capac, Croswell, Mich.: Sewers and sewage treatment plants	112,000	Do.
Angola, Brocton, and Depew, N. Y.: Sewage-treatment plants	531,000	Plans approved.
Ashtabula, Ohio: Primary sewage treatment with added chlorination	450,000	Plans not available.
Auburn and Garrett, Ind.: Interceptors and sewage treatment plants	140,000	Do.
Berne, Ind.: Interceptors and sewage treatment plant	45,000	Do.
Birmingham, Melvindale, Northville, Pontiac, Plymouth, Rochester, and Wayne, Mich.: Sewage treatment plants, interceptting sewers, construction, and improvement.	514,000	Do.
Brighton, Carleton, Monroe, Rockwood, South Lyon, Mich.: Sewers and sewage-treatment plants	233,000	Do.
Bryan, Bluffton, Ottawa, Paulding, and Wauseon, Ohio: Complete sewage-treatment plants	288,000	Plans not completed.
Bucyrus, Carey, and Crestline, Ohio: Sewers and/or sewage-treatment plants	474,000	Plans not available.
Conneaut, Ohio: Primary sewage-treatment plant with chlorination	220,000	Do.
Cuyahoga Falls, Hudson, Kent, and Rocky River, Ohio: Interceptors, Cuyahoga Falls to Akron; improvement of existing plants and sewage-treatment plans for first mentioned 4 cities.	855,000	Plans not fully developed.
Decatur, Ind.: Intercepting sewers and sewage-treatment plant	135,000	Plans not available.
Deshler, Leipsic, and North Baltimore, Ohio: Complete sewage-treatment plants	200,000	Plans not prepared.
Detroit, Mich.: Intercepting sewers to sewage-treatment plant	10,000,000	Plans partly made but scope of project not yet definite.
Erie, Pa.: New construction, extension, and repairs, sanitary and storm sewers	435,000	Plans not completed.
Fremont, Tiffin, and Upper Sandusky, Ohio: Sewage-treatment plants	395,000	Plans not available.
Grafton, Ohio: New sewers and complete sewage-treatment plant	130,000	Do.
Hudson and Morenci, Mich.: Sewers and sewage-treatment plants	210,000	Do.
Huron, Ohio: Interceptors and primary sewage-treatment plant	50,000	Do.
Lochmoor, Marine City, Marysville, and Port Huron, Mich.: Sewer system and sewage-treatment plants.	830,000	Do.
Lorain, Ohio: Primary sewage treatment plant with additional chlorination	700,000	Do.
Maumee and Toledo, Ohio: Sewage treatment plants, construction and repairs	1,000,000	Do.
New Baltimore, Richmond, Sandusky, St. Clair, St. Clair Shores, and Yale, Mich.: Sewers and sewage treatment plants.	208,000	Do.
Painesville, Ohio: Complete sewage treatment plant	400,000	Do.
Wellington, Ohio: Sewage treatment plant	130,000	Do.
Willoughby, Ohio: Primary sewage treatment plant	150,000	Do.
Pollution and water supply:		
Geneva and Harbor View, Lucas County, Ohio: Water mains, sewage treatment plants, and sewer systems.	190,000	Do.
Toledo, Ohio: Water mains and sanitary sewers	185,000	Plans not completed.

Great Lakes—St. Lawrence Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Erie—Continued.		
Recreation and wildlife:		
Summit County, Ohio: Recreation Lake	$870,000	Plans not available.
Water supply:		
Adrian, Birmingham, Northville, Plymouth, Pontiac, and Rochester, Mich: Public water supply, softening and iron removal.	609,000	Do.
Cleveland, Ohio: Supplementary water supply	6,000,000	Plans completed.
Grosse Isle, Highland Park, Rockwood, and Romulus, Mich.: Public water supply plants	470,000	Plans not available
Monroeville, Ohio: Water purification plant	30,000	Do.
Ontario:		
Flood control:		
Black River, N. Y.: Removal of bars in River at Lyons Falls and Carthage and construction of embankments.	75,000	
Carthage, N. Y.: Dam in Black River	75,000	
Owasco Lake, N. Y.: Outlet channel and control works	100,000	Plans completed.
Seneca River, N. Y.: Regulating outlet of Seneca River at Cayuga Lake	10,000	
Flood control and power:		
Black River, Panther Mountain, N. Y.: Reservoir for stream regulation and power	4,000,000	Do.
Genesee River, N. Y.: Mount Morris Reservoir for stream flow regulation	6,500,000	
Navigation:		
Great Sodus Bay Harbor: Increase depth in lake approach to 20 feet	118,000	Sum needed to complete.
Pollution:		
Caledonia, N. Y.: Sewage-treatment plant	120,000	
Camillus, N. Y.: Sewage-treatment plant	60,000	
Dansville, N. Y.: Sewage-treatment plant	150,000	Plans approved.
Geneseo, N. Y.: Sewage-treatment plant	95,000	
Recreation and wildlife:		
Lake Thendara, N. Y.: Recreation project	300,000	Plans completed.
Water supply:		
Gasport, N. Y.: Water-supply system	96,000	Do.
Oneida, N. Y.: Filtration plant	125,000	
Port Byron, N. Y.: Water-supply system	100,000	
Rochester, N. Y.: Honeoye Lake Reservoir for water supply	4,500,000	
St. Lawrence:		
Flood control:		
Newton Falls, N. Y.: Flood control reservoir	870,000	
Titusville Reservoir, Salmon River, N. Y.: Flood relief and low-water control	918,000	
Water supply:		
Gouverneur, N. Y.: New water supply	114,000	
International waters:		
Navigation:		
Great Lakes-St. Lawrence Deep Waterway: Including deepening of upper lake channels, navigation canal in international rapids section, and power installations on American side.	265,000,000	Contingent upon ratification of pending international agreement.
Niagara River: Compensating works	700,000	This may be undertaken as soon as a suitable agreement with the Canadian Government is concluded. Approved by International Joint Commission.
St. Clair River: Compensating works	2,900,000	Do.
Niagara Falls: Preservation of scenic value and power	875,000	This may be undertaken as soon as a suitable agreement with the Canadian Government is concluded.

I. The Upper Mississippi

The principal uses of the Mississippi River above St. Louis relate to disposal of wastes, to navigation, to municipal water supplies, and, to a limited extent, to water power.

The river serves as a sewer, and is seriously polluted below certain large cities. As a result, fish life, water-supply sources, and recreational facilities are greatly impaired. Wastes from an urban population of about 8,000,000 affect the stream from which various municipalities draw their water supplies.

The canalization of the river which is now underway will provide by 1940 a channel 9 feet in depth from Alton to Minneapolis. Some of the flowage rights required have been transferred to the Bureau of Biological Survey in connection with the development of the upper Mississippi wildlife refuge. Protection for the more valuable agricultural lands of the flood plains, not now protected by drainage and levee systems, is authorized by the Flood Control Act of 1936. Thus progress recently has been made along several lines in realizing the potentialities of the upper river and its valley.

Most existing problems of the Mississippi below St. Paul can be solved by the long-range plans for the upper river and its tributaries which are discussed in subbasin reports. All the plans contemplate adequate treatment of domestic and industrial wastes, a procedure that would maintain at all times a desirable minimuum sanitary standard. Other outstanding features of the plans for the several subbasins are, in outline, as follows:

1. *Mississippi River above St. Paul.*—Flow correction to safeguard the future water supply of St. Paul and Minneapolis and to enhance natural recreationai facilities is the first objective. Regulation of lake levels to aid in flow correction and to help maintain the important tourist industry is of similar importance. Flow correction is recommended as the primary purpose of existing reservoirs operated by the United States.

2. *Minnesota River.*—The chief feature is to correct stream flow by main stem and tributary storage, to protect agricultural lands subject to a periodic overflow, to improve sanitation, and to provide reliable surface sources of water supply in the event underground supplies become inadequate or unsatisfactory.

3. *Upper eastern tributaries (including the St. Croix, Chippewa, Trempealeau, Black, Buffalo, and La Crosse Rivers).*—Lake-level regulation and storage regulation to improve recreational facilities, to facilitate water-power development, and to reduce silting are the important features. The value of recreational areas overshadows that of the agricultural lands.

4. *Minor tributaries in southeast Minnesota and northeast Iowa (including the Cannon, Zumbro, Root, upper Iowa, Turkey, Maquoketa, and Wapsipinicon Rivers).*—Flood correction by small reservoirs and improvement of water-supply sources are the primary objectives.

5. *Wisconsin River.*—Possibilities of inexpensive flow regulation and the availability of power sites indicate that water-power development is of considerable importance. Flow correction by storage and lake-level regulation will be important also to the recreational facilities.

6. *Rock River.*—In this area, flow correction by storage regulation is the chief objective of the plan. It would reduce flood damage, furnish surface water to replace failing ground-water sources, and improve the primary power possibilities at potential water-power sites.

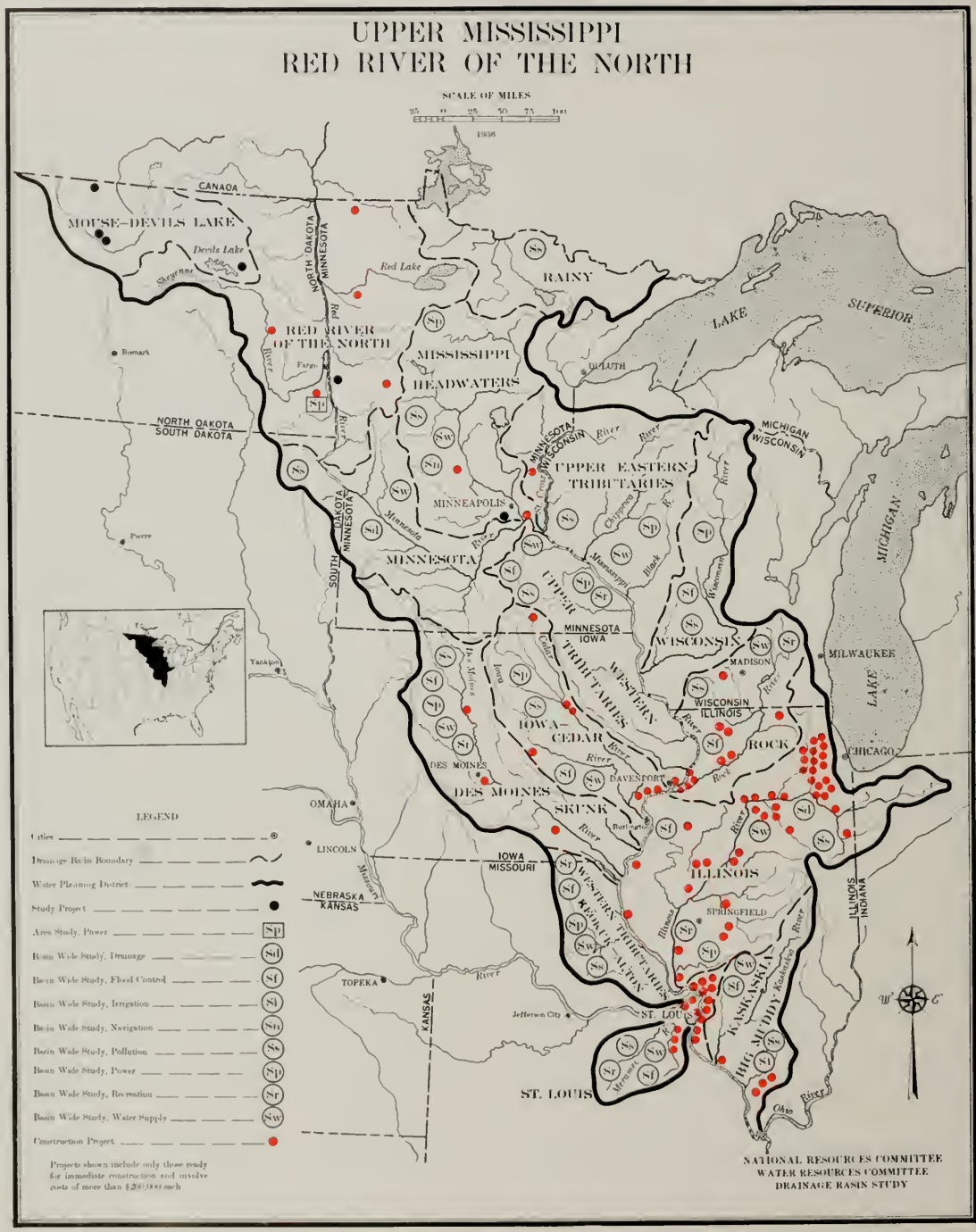
7. *Iowa-Cedar Rivers.*—Better sanitation and improved water-supply sources are the principal water needs of these basins for which the plan makes provision.

8. *Des Moines-Skunk Rivers.*—Proposed reservoir control above the city of Des Moines would reduce flood damage and improve sanitation, water-supply sources, and water-power possibilities. It would also promote the development of water-recreational facilities, now meager except near the headwaters.

9. *Minor tributaries in southeast Iowa and northeast Missouri (including the Fox, Wyaconda, Fabius, North, Salt, and Cuivre Rivers).*—The plan recognizes flow correction as a fundamental need of these basins for reduction of flood damage and for erosion control. Additional surface-water sources are also needed. The configuration of the land favors small-reservoir development.

10. *Illinois River.*—The Illinois and its tributaries drain a highly developed agricultural and manufactural area which warrants maximum realization of water-resource values. No major reservoir sites are available, but it will be desirable to investigate many small reservoir sites, which, if developed, may have an appreciable combined effect on flood flows. Other small reservoirs are recommended as recreational centers and water-supply sources.

11. *Meramec-St. Louis Basin.*—Flow correction of the Meramec, flood protection of bottomlands, improved


UPPER MISSISSIPPI
RED RIVER OF THE NORTH
SCALE OF MILES
1936
CANADA
MOUSE–DEVILS LAKE
Devils Lake
Sheyenne
NORTH DAKOTA
MINNESOTA
Red Lake
RAINY
LAKE
SUPERIOR
RED RIVER OF THE NORTH
Red River
Fargo
Bismark
MISSISSIPPI HEADWATERS
DULUTH
NORTH DAKOTA
SOUTH DAKOTA
MINNESOTA
WISCONSIN
River
MICHIGAN
WISCONSIN
UPPER EASTERN TRIBUTARIES
MINNEAPOLIS
Minnesota River
Chippewa R.
Black River
Wisconsin River
Pierre
SOUTH DAKOTA
MINNESOTA
MINNESOTA
UPPER MISSISSIPPI
MINNESOTA
IOWA
WISCONSIN
MILWAUKEE
MADISON
MICHIGAN
LAKE
Yankton
Des Moines River
Iowa River
WESTERN TRIBUTARIES
WISCONSIN
ILLINOIS
IOWA–CEDAR
Cedar River
ROCK
River
CHICAGO
DES MOINES
DAVENPORT
Rock River
DES MOINES
SKUNK
River
Burlington
OMAHA
LINCOLN
IOWA
MISSOURI
Missouri River
ILLINOIS
NEBRASKA
KANSAS
WESTERN TRIBUTARIES
KENTUCKY–MERAMEC
SPRINGFIELD
Illinois River
INDIANA
ILLINOIS
TOPEKA
Kansas River
KANSAS
Jefferson City
ST. LOUIS
KASKASKIA
Kaskaskia River
BIG MUDDY
Meramec River
ST. LOUIS
Ohio River
W
E
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Study Project
Area Study, Power (Sp)
Basin Wide Study, Drainage (Sd)
Basin Wide Study, Flood Control (Sf)
Basin Wide Study, Irrigation (Si)
Basin Wide Study, Navigation (Sn)
Basin Wide Study, Pollution (Sk)
Basin Wide Study, Power (Sp)
Basin Wide Study, Recreation (Sr)
Basin Wide Study, Water Supply (Sw)
Construction Project
Projects shown include only those ready for immediate construction and involve costs of more than $25,000 each
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

storm-water drainage, sanitation of congested recreational centers, and storage in small reservoirs for recreation and water supply are the outstanding features of the water plan.

Remedial measures recommended for the tributary basins would considerably increase low flows and reduce high flows in the upper Mississippi. Thus the value of the upper river to its basin would be enhanced.

II. Red River of the North

The plan for the drainage area of the Red River of the North provides for such diverse but interrelated matters as abatement of stream pollution, control of low-water flow, improvement of municipal and rural water supplies, correction of flood flow in streams, protection against grave distress from future droughts, enhancement of recreational values in natural lakes, wildlife conservation, and promotion of the utility of water for power development, all in the common interest of the people of the basin regardless of State lines. The individual projects set forth below, together with others already under way, have the complementary and integrated relationships requisite for the accomplishment of the plan, which has the support of the three States, Minnesota, North Dakota, and South Dakota, within which the basin lies.

Upper Mississippi—Red River of the North Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Red River of the North:		
Flood control:		
Study for flood channel improvement of Red River below Ottertail River	$20,000	
Surveys and plans, small conservation dams	20,000	
Water power:		
Study of the Ottertail, Red Lake, and Sheyenne Basins to determine the possibilities for new water-power developments and for improvement in existing developments.	5,000	
Mouse-Devils Lake:		
Flood control:		
Collection of factual data concerning the flow of the Souris River with thorough consideration of its international aspects.	40,000	
Minot, N. Dak.: Investigation of flood prevention	5,000	
Water supply:		
Burlington, N. Dak.: Investigation of further water supply	5,000	
Devils Lake City, N. Dak.: Investigation of possible sources of improved watersupply, including Sweetwater Lake.	6,000	
Rainy River:		
Pollution:		
Study of pollution problems in Rainy River, Minn	5,000	
Mississippi headwaters:		
Water power and navigation:		
Study of flow regulation by review of existing data and reports and collection of new data to determine means for increasing the minimum stream flow and to provide for water conservation, power development, and navigation.	25,000	
Water supply and pollution:		
Study of existing water supplies and of urban centers not now supplied with waterworks to determine needs and make recommendations to improve supplies; also to make recommendations for the abatement of pollution from domestic and industrial wastes.	5,000	
Miscellaneous:		
Study to determine the economic value of the Minnetonka water conservation project, which plans to raise the water level of Lake Minnetonka by the diversion of water from the Crow River.	5,000	
Minnesota:		
Drainage:		
Study and survey of State land-drainage works	30,000	
Flood control:		
Study of flow regulation throughout basin, including study to determine the functional utility of headwaters reservoirs in South Dakota.	105,000	
Study of regulation of lake levels to determine most desirable development for each lake	25,000	
Pollution:		
Study of sanitary condition of rivers and condition of ground waters throughout entire basin	40,000	
Upper Mississippi, eastern tributaries:		
Pollution and water supply:		
Study of general sanitation conditions and water-supply needs in urban and rural areas	10,000	
Water power:		
Study of potential water-power developments and their interrelation with existing developments	15,000	
Miscellaneous:		
Study of lake levels and storage by review of existing data and reports and the collection of new data to form the basis for a program designed to restore lake levels and increase storage of precipitation.	10,000	
Upper (Mississippi) western tributaries:		
Pollution:		
Study of sanitation conditions in urban and rural areas to determine needs for abatement of pollution from domestic and industrial waste.	5,000	
Water power, flood control, water supply, and recreation:		
Study to determine the economic feasibility of works for flow improvement in combination with water power, flood control, future water supplies, and recreation throughout the basin.	30,000	
Wisconsin:		
Flood control:		
Study to determine most practical and economical means of effecting flood control on Kickapoo and Galena Rivers.	10,000	
Pollution:		
Study of waste disposal and pollution of water supplies in the basin to supplement existing information and to formulate a program for improved sanitary conditions throughout entire basin.	10,000	
Water power:		
Study of flow regulation and power development problems and lake level regulation and the possibilities of diverting part of the Wisconsin flow into the Fox River to increase its low flows for sanitary purposes.	50,000	
Rock:		
Flood control, recreation, and water supply:		
Studies of flow regulation to determine the most feasible plan for minimizing flood damages and increasing low flows in the Rock River Basin with particular emphasis on the Pecatonica River, including an investigation of tributary reservoir sites possible of development for water supply, flow regulation, and/or recreation.	60,000	

Upper Mississippi—Red River of the North Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
1. Investigation Projects—Continued		
Rock—Continued.		
Water supply and pollution:		
Study of existing water supplies and of urban centers not now supplied with water works to determine needs and make recommendations to supplement previous study. Also studies and recommendations for the abatement of pollution from domestic, industrial, and mine wastes and aquatic growths.	$15,000	
Iowa-Cedar:		
Flood control and water supply:		
Study to determine projects economically sound for flood control and water power, and a continuing study of water supply and sanitation; and an analysis of hydrologic data already collected on Ralston Creek.	60,000	
Des Moines-Skunk River.		
Drainage:		
Study of flow regulation in entire basin to determine economical minimum flows and storage facilities and their interrelation with water power, waste disposal, water supply and the adequacy of water for agricultural needs in dry years; and a continuing study of water supply and sanitation; and a study to determine best ultimate use of area known as Green Bay levee and drainage district.	32,000	
Water power:		
Study of possible new water-power developments and of redevelopment of existing water powers	70,000	
Illinois:		
Miscellaneous:		
General studies as a basis for a coordinated program of sanitation, drainage, flood correction, water supply, water power, and recreation.	200,000	
Western tributaries Keokuk-Alton.		
Flood control:		
Study of all possible small reservoir sites for flow regulation and/or recreation	20,000	
Study of flood control and water power on the Salt and Fabius Rivers in Missouri	25,000	
Water supply:		
Study of existing water supplies and of urban centers not now supplied with waterworks to determine needs. Also studies to make recommendations for the abatement of pollution from wastes.	10,000	
St. Louis.		
Recreation:		
Study for improvement of recreational facilities throughout the entire basin to determine the feasibility of artificial lakes along the Meramec River in conjunction with flood correction and lake developments along the Mississippi.	10,000	
Miscellaneous:		
Studies to develop recommendations for the abatement of pollution from any source; and studies to ascertain present and probable future water-supply needs and to make recommendations.	20,000	
Kaskaskia-Big Muddy:		
Flood control:		
Flow regulation studies: (1) To determine the functional utility of any reservoir sites possible of development for general conservation or as specific water supplies; (2) to determine methods of flood correction for agricultural lands along the Kaskaskia; (3) to make recommendations concerning the adequacy of water for agricultural needs in dry years.	32,000	
Miscellaneous:		
General study involving procurement, correlation, and analysis of all necessary engineering, economic, and social data, including studies of urban water supply and of stream sanitation to determine needs and make recommendations.	50,000	
2. Construction Projects		
Red River of the North:		
Flood control:		
Ottertail, Red, and Sheyenne Rivers: Channel improvements for low-water flow	355,000	Surveys and plans are available.
Park River levee and channel straightening for flood control	45,000	Survey being made.
Red Lake River: Channel improvements and control works	437,000	Plans available. Project urgent.
Sheyenne River diversion: Ditch to divert low-water flow from Sheyenne River to Dakota Wild Rice River, including diversion dam.	95,000	
Pollution:		
Abercrombie, N. Dak.; Ada, Argyle, Bagley, Barnesville, Battle Lake, Blackduck, Breckenridge, and Callaway, Minn., Casselton and Cavalier, N. Dak.; Crookston, Detroit Lakes, Dilworth and Donnelly, Minn.; Drayton, N. Dak.; East Grand Forks and Elbow Lake, Minn.; Enderlin and Fairmount, N. Dak.; Fergus Falls, Fertile, Fosston, Frazee, and Graceville, Minn.; Grafton, N. Dak.; Hallock and Halstad, Minn.; Harvey, N. Dak.; Hawley and Herman, Minn.; Hillsboro, N. Dak.; Kelliher, Minn.; Kindred, N. Dak.; Lake Park, Minn.; Larimore and Maddock, N. Dak.; Mahnomen, Minn.; Mayville, Milnor, and Minto, N. Dak.; Moorhead, Minn.; Neche, N. Dak.; New York Mills and Northome, Minn.; Park River, N. Dak.; Pelican Rapids, Minn.; Pembina, N. Dak., Perham, Minn.; Portland, N. Dak.; Red Lake Falls and Roseau, Minn.; Sheyenne and St. Thomas, N. Dak.; Thief River Falls and Twin Valley, Minn.; Wahpeton and Walhalla, N. Dak.; Warren, Minn.; West Fargo, N. Dak.; Wheaton, Minn.; Wyndmere, N. Dak.; Wolverton, Minn.; Valley City, N. Dak.: Sewer systems and sewage-treatment plants.	2,546,000	
Water supply:		
Abercrombie, Alice, Amenia, Aneta, Anselm, and Ardoch, N. Dak.; Argyle, Minn.; Ayr, N. Dak.; Bagley, Barnesville, and Battle Lake, Minn.; Blabon, N. Dak.; Blackduck, Minn.; Blanchard and Bowesmont, N. Dak.; Breckenridge, Minn.; Buffalo, Buttzville, and Buxton, N. Dak.; Callaway and Campbell, Minn.; Casselton, Cayuga, Cavalier, Chaffee, Christine, Clifford, Cooperstown, Colgate, and Conway, N. Dak.; Crookston, Minn.; Crystal, Cummings, and Dazey, N. Dak.; Detroit Lakes and Donnelly, Minn.; Drayton, N. Dak.; Dumont, Minn.; Dwight, N. Dak., East Grand Forks, Minn.; Eckelson, N. Dak.; Elbow Lake, Minn.; Elliott, Enderlin, Englevale, Erie, and Fairdale, N. Dak.; Fergus Falls and Fertile, Minn.; Fingal and Finley, N. Dak., Fosston, Minn.; Fordville and Forest River, N. Dak.; Frazee, Minn.; Galesburg, Glasston, Grafton, and Great Bend, N. Dak.; Hallock and Halstad, Minn.; Hamar, Hamberg, Hamilton, Hannaford, Hansboro, and Hastings, N. Dak.; Hawley, Minn.; Heimdal and Hensel, N. Dak.; Herman, Minn., Hope, Hoople, Hunter, Kathryn, and Kindred, N. Dak.; Lake Park, Minn.; Langdon, Lankin, Lisbon, Litchville, Maddock, Manvel, and Martin, N. Dak.; Matton, Minn.; McCanna, N. Dak.; McIntosh, Minn.; McLeod, McHenry, Mekinock, Michigan, and Minto, N. Dak.; Moorhead, Minn.; Moreton, Mountain, and Neche, N. Dak.; New York Mills, Minn.; Niagara and Nome, N. Dak.; Northome, Minn.; Northwood, N. Dak., Oklee, Minn.; Orilka, Orr, Page, Park River, and Pekin, N. Dak.; Pelican Rapids, Minn.; Pembina, N. Dak.; Perham, Minn.; Pillsbury, Pisek, and Portland, N. Dak.; Red Lake Falls, Minn.; Reynolds, N. Dak.; Roseau, Minn.; Rutland, Sanborn, Sharon, Sheldon, Sheyenne, and St. Thomas, N. Dak.; Thief River Falls, Minn.; Thompson, Tolna, and Tower City, N. Dak.; Twin Valley, Minn.; Valley City, Wahpeton, and Walum, N. Dak.; Warren, Minn.; Wellsburg, Wettman, and Wheatland, N. Dak.; Wheaton, Minn.; Wimbledon, N. Dak.; Wolverton, Minn.; Wyndmere, N. Dak. Water-supply and water-treatment plants.	2,358,000	

Upper Mississippi—Red River of the North Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Red River of the North—Continued.		
Miscellaneous:		
Baldhill Reservoir on Sheyenne River near Valley City for water conservation, stream regulation, and pollution reduction.	$778,000	
Dakota Wild Rice, Goose-Pembina, Red Lake, Sheyenne, and Snake-Roseau Basins: 36 small dams and reservoirs on principal streams for water conservation, local water supply, and recreation.	436,000	
Ottertail and Pelican Rivers: Construction of 51 small dams for water conservation and control	244,000	
Roseau Reservoir and diversion, on Roseau River for flood control, recreation, wildlife conservation and water conservation.	1,301,000	Plans ready.
Mouse-Devils Lake:		
Irrigation:		
Burlington, N. Dak.: On Des Lacs River—water storage for irrigation	90,000	
Eaton irrigation district—water storage	75,000	Plans completed.
Pollution:		
Berthold, Bowbells, Columbus, Dunseith, Kenmare, Portal, Towner, Velva, Westhope, and Willow City, N. Dak.: Sewer systems and sewage treatment plants.	345,000	
Bisbee, Cando, Devils Lake, Lakota, and Leeds, N. Dak.: Sewage treatment plants	190,000	
Recreation and wildlife:		
Ambrose, Balfour, Deering, Donnybrook, Eckman, Foxholm, Hartland, Kenaston, Logan, Maxbass, Sherwood and Upham, N. Dak.; and Bottineau, Burke, McHenry, Rolette, and Ward Counties, N. Dak.: 23 small dams for recreation and water conservation.	152,000	
Burke County, N. Dak.: Water improvements in Lostwood Migratory Waterfowl Refuge	46,000	
Devils Lake City, N. Dak.: Improvement of Sullys Hill Game Preserve at Fort Totten	34,000	Do
Lakes Metigoshe and Upsilon, N. Dak.: Regulation of lake levels for recreational use, Carpenter Lake, Long Lake, and Rost Lake.	25,000	
Nelson, Ramsey, Rolette and Towner Counties in North Dakota: Minor water conservation and recreational projects: 9 North Dakota lakes.	39,000	
Water supply:		
Ambrose, Antler, Bertbold, Balfour, Crosby, Columbus, Deering, Flaxton, Glenburn, Gardena, Larson, Loraine, Mohall, Lansford, Newburg, Noonan, Overly, Portal, Ruso, Sherwood, Souris, Tagus, Tolley, Thorne, and Velva, N. Dak.: Surveys and new wells.	26,000	
Berthold, Columbus, Dunseith, Portal, Westhope, and Willow City, N. Dak.: Urban water supply improvements and water treatment plants.	203,000	
Bisbee, N. Dak.: Water supply improvement	37,000	
Minot, N. Dak.: Water treatment plant	20,000	
Miscellaneous:		
Sweetwater Lake, N. Dak.: Increased tributary drainage to raise lake to higher level for better quality of water, recreational use, and possible water supply to Devils Lake City.	10,000	
Rainy:		
Pollution:		
Baudette, International Falls, Minn.: Sewage systems and treatment plants	41,000	Plans made.
Water supply:		
Bellows Lake, Grove Lake, Horseshoe Lake, Jack-the-Horse Lake, Little Turtle Lake, Maple Lake, and North Star Lake, Minn.: Water supply.	14,000	Do.
Big Falls and Warroad, Minn.: Water supply systems	15,000	Do.
International Falls, Minn.: Water supply system	187,000	Do.
Miscellaneous:		
Lake Vermilion, Minn.: Outlet works, water conservation	19,000	Plans made. Pending acquisition of land.
Mississippi headwaters:		
Pollution:		
Alexandria, Bertha, Cokato, Grove City, Glencoe, Ah Gwah Ching, Nashwauk, Little Falls, and St. Paul, Minn.: Sewer systems.	114,000	Plans completed. Ready for construction.
Anoka, Bemidji, Robbinsdale, Wadena, and Waite Park, Minn.: Storm sewers	129,000	Do.
Buffalo, Minn.: Sewage treatment plant	8,000	Plans completed.
St. Cloud, Minn.: Sewage treatment plant	420,000	Do.
Water supply:		
Alexandria, Anoka, Bertha, Elk River, Parkers Prairie, Pierz, Robbinsdale, St. Martin, Trommald, and Wayzata, Minn.: Water supply systems.	138,000	Plans completed and ready for construction.
St. Paul, Minn.: Additional water treatment	227,000	Do.
Miscellaneous:		
Aitkin, Anoka, Carlton, Cass, Crow Wing, Douglas, Hennepin, Isanti, Itasca, Stearns, and Todd Counties, Minn.: Water conservation projects at 108 points.	226,000	Ready for construction.
Minnesota:		
Pollution:		
Benson, Dalton, Henderson, Morris, and Wells, Minn.: Sewage treatment	76,000	Preliminary plans made.
Clara City, Clarkfield, Hancock, and Lowry, Minn.: Sewer systems and sewage treatment plants	127,000	Do.
Danube, Delavan, Elysian, Good Thunder, and Hoffman, Minn.: Sewer systems	13,000	
New Ulm, Minn.: Sewage treatment plant	131,000	Do.
New Ulm and Willmar, Minn.: Sewer system extensions	4,000	Do.
Water supply:		
Benson, Browns Valley, Chaska, Clara City, Clarkfield, Cyrus, Glenwood, New Prague, Marshall, Tracy, and Triumph, Minn.: Water-treatment plants.	104,000	
Big Stone City, S. Dak.: Water-supply system	70,000	
Dalton, Minn.: Water-supply system and treatment plant	24,000	
Farwell, Hoffman, and Ruthton, Minn.: Water-supply systems	22,000	
Sisseton, S. Dak.: Waterworks system	80,000	Preliminary plans completed.
Miscellaneous:		
Cedar, New Ulm, Scandinavian, Sleepy Eye, and Wood Lake, Minn.: Dams and reservoirs for water conservation and recreation.	170,000	Do.
Willmar, Minn.: 6 dams and 6 channel improvement projects in chain of lakes for water conservation.	135,000	Do.
22 small dams and channel improvement for water conservation and flow correction in Minnesota	68,000	
Upper (Mississippi) eastern tributaries:		
Pollution:		
Askov, Minn.; Baldwin, Wis.; Bayport (State prison), Minn.; Bloomer, Clear Lake, Coon Valley, Frederic, Glenwood, Hammond, Hayward, Hudson, and Medford, Wis.; Mora and Pine City, Minn.; St. Croix Falls, Wis.; Stillwater, Minn., and Webster, Wis.: Sewers and/or sewage treatment.	666,000	Ready for construction.
Recreation and wildlife:		
Buffalo and Trempealeau Counties, Wis.: Trempealeau River migratory waterfowl refuge project	150,000	
Water supply:		
Askov, Minn.; Augusta, Dresser Junction, Wis.; Bayport (State prison), Minn.; Eau Claire, Wis.; Mora, Minn.; North Hudson, Wis.; Taylors Falls, Minn.; and Webster, Wis.: Water-supply systems and/or water treatment.	179,000	Do.
Sparta, Wis.: Water-supply system and sewage treatment, including tanks for Camp McCoy	27,000	
Miscellaneous:		
Bayfield, Douglas, Eau Claire, Iron, Price, Rusk, Sawyer, and Washburn Counties, Wis.: Lake-level control and water conservation in 13 lakes.	26,000	Surveys made. Plans not completed.
Bolger, Clam Lake, Lake of the Falls, Minerva, and Nancy, Wis.; Pokegama Lake (Pine County), Minn.; Round Lake, Sissabagama, St. Croix, and Totogatic, Wis.: Water conservation.	430,000	Ready for construction.
Chisago County, Minn.: Chisago Chain of Lakes project for conservation of water	260,000	Ready for construction, pending legal settlements.

Upper Mississippi—Red River of the North Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Upper (Mississippi) western tributaries:		
Flood control:		
Decorah, Iowa: Reservoir at mouth of Dry Run and channel enlargement on upper Iowa River	$120,000	Detail plans being prepared. Authorized by Congress.
Cascade, Iowa: Cleaning and straightening channel North Fork of the Maquoketa River	20,000	Necessary to complete project now under way.
Green Island, Iowa: Iowa levee and drainage district no. 1, improvement to levee	68,000	Authorized by Congress. Plans being prepared.
McGregor, Iowa: Construction for flood control	115,000	
Navigation:		
Mississippi River from mouth of the Missouri River to Minneapolis: 9-foot navigation channel including 26 dams and locks.	35,000,000	Under construction. Estimated cost needed to complete project.
Pollution:		
Anamosa, Dyersville, Elkader, Independence, Manchester, Maquoketa, and Monticello, Iowa: Complete sewage-treatment plant.	297,000	Preliminary plans only are available.
Central City, Fredericksburg, Hawkeye, and Tripoli, Iowa, and Faribault, South St. Paul, and West St. Paul, Minn.: Sewage-treatment-plant extensions.	39,000	Partial only; plans completed.
Houston, Lewiston, and Owatonna, Minn.: Sewage-treatment plant for partial treatment	253,000	Plans completed.
Kellogg, Minn.: Sewer system and treatment plant	33,000	Do.
Oelwein and Waukon, Iowa: Preliminary treatment plants for industrial waste from creamery	10,000	Preliminary plans only are available.
Olin, and Oxford Junction, Iowa: Primary sewage-treatment plant	9,000	Do.
Water supply:		
Calamus, Comanche, Delhi, and Hazelton, Iowa; Hokah and Northfield, Minn.; Oelwein and Volga, Iowa; Waterville, Minn.; Waucoma, Iowa: Water-supply systems.	252,000	Partial plans only are available.
Miscellaneous:		
Houston County, Beaver Valley Dam; Le Sueur County, Volney and Dora Dams; Olmsted County, Silver Creek and Shady Lake Dams; Rice County, Cedar, Willings, Union, Mazaska, Dudley, French, and Lower Hatch Dams; Steele County, Owatonna Dam; Waseca County, Watkins Dam; Minn.: Dams for water conservation and recreation.	156,000	Preliminary plans completed.
Wisconsin:		
Pollution:		
Abbotsford, Colby, and Eagle River, Wis.; Galena, Ill.; Lodi, Minocqua, Prairia du Sac, Tomah, and Wonewoc, Wis.: Sewer systems and/or sewage-treatment plants.	357,000	Preliminary plans and estimates completed.
Athens, Biron, Baraboo, Cambria, and Cashton, Wis.; East Dubuque, Ill.; Elroy, Hillsboro, Lancaster, La Farge, Mauston, Mosinee, Nekoosa, New Lisbon, Port Edwards, Reedsburg, Richland Center, Rothschild, Stevens Point, Stratford, Tomahawk, Wauzeka, Wisconsin Dells, Wisconsin Rapids, and Viola, Wis.: Sewage-treatment plants.	420,000	Rough cost estimates only are available. No plans reported.
Benton, Clubb, Edgar, Gays Mills, Hazel Green, Mazomanie, Merrill, Muscoda, Necedah, North Freedom, Pittsville, Poynette, Readstown, Rhinelander, Rib Lake, Rio, Schofield, Soldiers Grove, Spring Green, Wausaw, and Wilton, Wis.: Sewer systems and sewage-treatment plants.	925,000	
Friendship and Marathon, Wis.: Sewer systems	28,000	
Water supply:		
Baraboo, Camp Douglas, Camp Williams, Edgar, Elroy, Friendship, Hillsboro, Lyndon Station, Marathon, Mosinee, Muscoda, Necedah, Pittsville, Poynette, Rib Lake, Rhinelander, Schofield, Shullsberg, and Stratford, Wis.: Water-supply systems or improvements to water supply.	644,000	Do.
East Dubuque and Galena, Ill.: Water-treatment plants	42,000	Field surveys not made.
Miscellaneous:		
Monroe County, Wis.: Dam to create new lake at Tomah Lake	36,000	No plans reported. Cost estimates only are available.
New Lisbon, Wis.: Dam to control lake level and restore old flowage	35,000	
Rock		
Drainage:		
Hillsdale, Ill.: Penny Slough levees and drainage ditches to protect agricultural lands	109,000	Authorized by Congress.
Carroll County, Ill.: Levee and drainage district no. 1, raising and enlarging existing levee system	13,000	Do.
Flood control:		
Fort Atkinson, Wis.: Flood gates for Indian Ford and Janesville Dams on Rock River	29,000	Do.
Pollution:		
Albany, Ashton, Atkinson, Buda, Byron, Cambridge, Capron, Carbon Cliff, Chadwick, Cherry Valley, Compton, Creston, Durant, Elizabeth, Erie, Forreston, Franklin, Genoa, Hampshire, Hanover, Huntley, Kingston, Kirkland, Lanark, Leaf River, Lee, Lena, Malta, Manlius, Maple Park, Marengo, Milan, Morrison, Mount Carroll, Ohio, Orangeville, Orion and Pearl City, Ill.: Sewer systems and/or sewage treatment plants.	1,871,000	
Albany, Belleville, Beaver Dam, Blanchardville, Cambridge, Clinton, Columbus, Darlington, Delavan, Dodgeville, Horicon, Jefferson, Mineral Point, Orfordville, Palmyra, Randolph, Reesseville, Sharon, Slinger, Waterloo, and Waupun, Wis.: Sewer systems and/or sewage treatment plants.	674,000	
Amboy, Harvard, Oregon, Prophetstown, and Stockton, Ill.: Sewer systems or extensions and sewage treatment plants.	897,000	Preliminary plans are available.
Annawan, Belvidere, Fulton, Neponset, Port Byron, Rochelle, Savanna, and Winnebago, Ill.: Sewer systems and/or sewage treatment plants.	459,000	
Argyle, Beloit, Fox Lake, Johnson Creek, Juneau, Madison, Oconomowoc, Oregon, and South Wayne, Wis.: Sewer systems, extensions, or sewage-treatment plants.	698,000	Do.
Brandon, Wis.: Sewage-treatment plant	102,000	Plans prepared.
East Moline, Ill.: Sewer extensions and sewage-treatment plant	654,000	
Freeport, Ill.: Sewer extensions and sewage-treatment plant	1,900,000	Preliminary plans prepared.
Moline, Ill.: Sewer extensions and sewage-treatment plant	3,250,000	
Rock Island, Ill.: Sewer extensions and sewage-treatment plant	3,700,000	Do.
Sterling, Ill.: Sewer extensions and sewage-treatment plant	1,045,000	Do.
Water supply:		
Amboy, Annawan, Apple River, Ashton, Belvidere, Buda, Byron, Cambridge, Camp Grant, Carbon Cliff, Chadwick, Cherry Valley, Creston, De Kalb, Dixon, Durand, East Moline, Elizabeth, Erie, Forreston, Franklin Grove, Fulton, Genesco, Genoa, Hampshire, Hanover, Harvard, Huntley, Kirkland, Lanark, Lena, Manlius, Marengo, Milan, Milledgeville, Morrisen, Mount Carroll, Mount Morris, Neponset, Ohio, Oregon, Pecatonica, Pole, Poplar Grove, Port Byron, Prophetstown, Rochelle, Rock Island Arsenal, Rockton, Savanna, Shannon, Sheffield, Silvis, South Beloit, Stockton, Sycamore, Tampico, Walnut, Warren, West Brooklyn, Winnebago, and Winslow, Ill.: Water supplies and/or water-treatment plants.	1,208,000	
Beaver Dam and Cambridge, Wis.; Compton, Ill.; Edgerton, Elkhorn, Fort Atkinson, Horicon, and Lake Mills, Wis.; Orion and Pearl City, Ill.; Stoughton and Watertown, Wis.: Water supply improvements and/or treatment plants.	473,000	
Darlington, Orfordville, and South Wayne, Wis.: Water supply systems	77,000	
Freeport, Ill.: Water treatment plant and water extensions	606,000	
Moline, Ill.: Water treatment and extensions	929,000	Plans prepared.
Oconomowoc, Wis.: Water treatment plant for softening and iron removal	61,000	
Rockford, Ill.: Water treatment plant and water extensions	126,000	
Rock Falls, Ill.: Water treatment plant and water extensions	165,000	
Rock Island, Ill.: Water treatment plant and water extensions	995,000	
Sterling, Ill.: Water treatment plant and water extensions	283,000	

Upper Mississippi—Red River of the North Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Iowa—Cedar:		
Pollution:		
Alden, Belmond, Clarksville, Clear Lake, Forest City, North English, State Center, Waverly, West Liberty, Iowa: Treatment plants for industrial waste.	$100, 000	No plans are available. Estimates only rough.
Austin, Minn.: Sewage-treatment plant	325, 000	Plans completed.
Belle Plaine, Cedar Falls, Marengo, Iowa: Sewage-treatment plants	132, 000	
Columbus Junction and Gladbrook, Iowa; Glenville and Hayfield, Minn.; La Porte City, Manly, Nora Springs, Northwood, Riverside, Shellrock, and Wapello, Iowa: Sewage-treatment plants.	197, 000	Preliminary plans completed.
Davenport, Iowa: Storm sewer for flood control	358, 000	Plans completed.
Davenport, Iowa: Sewage-treatment plant	792, 000	Do.
Marshalltown, Iowa: Sewage-treatment plant	464, 000	Do.
Muscatine, Iowa: Sewage-treatment plant	200, 000	No plans available.
Waterloo, Iowa: Sewage-treatment plant	1, 051, 000	Plans completed.
Waterloo, Iowa: Channel improvement for sanitation	300, 000	No plans are available.
Water supply:		
Buffalo, Kalona, and Le Claire, Iowa: Water-supply systems	140, 000	
Des Moines—Skunk:		
Pollution:		
Adel, Colfax, Eldon, Lehigh, Panora, and Redfield, Iowa: Primary sewage-treatment plants	46, 000	No action has been taken. Colfax plans may call for complete sewage treatment at cost of $35,000 instead of $12,000.
Algona, Eagle Grove, Emmetsburg, Jefferson, and Webster City, Iowa: Sewage-treatment plants	260, 000	No action has been taken.
Bagley and University Park, Iowa: Secondary sewage-treatment or new plants	20, 000	Do.
Des Moines, Iowa: Sewage-treatment plant for domestic and industrial wastes	2, 000, 000	Plant ordered by board of health; city has appealed to district court.
Fort Dodge, Iowa: Sewage-treatment plant for domestic and industrial wastes	490, 000	Plans filed with board of health.
Knoxville, Iowa: New sludge bed and drain for sewer system	2, 000	Land acquired and surveys begun.
Ottumwa, Iowa: Sewage-treatment plant for domestic and industrial wastes	750, 000	Plant ordered by board of health; city has appealed to district court. Design should include flood control features.
Perry, Iowa: Additional sewage-treatment plant, new settling tank, and additional filters	72, 000	
Water supply:		
Dallas, Eddyville, Lovilia, Melcher, Richland and Williamson, Iowa: Water supply and distribution systems.	444, 000	No reports available. Surface storage probably will be developed except at Eddyville where infiltration galleries are possible. Dallas system might combine with that of Melcher.
Fairfield and Wayland, Iowa: Water-supply systems	76, 000	Plans available.
Illinois:		
Flood control:		
Baum's Levee between Shelby Bridge and Baum's Bridge on Kankakee River in Indiana: Flood protection for farm lands.	177, 000	Authorized by Congress.
Illinois River in Illinois: Levee set backs and floodway improvement from Beardstown to mouth of river.	1, 100, 000	Do.
Sangamon River, Ill.: Levees and/or channel improvements at 15 localities on Sangamon River and its tributaries in Illinois for flood protection.	903, 000	Do.
Sangamon River, Ill.: Straightening channel from mouth of Salt Creek to Roby	773, 000	Do.
Sangamon River, Ill.: Clearing and enlarging flood channel	136, 000	Do.
Navigation:		
La Grange and Peoria, Ill.: Lock and dams and channel improvement of Illinois River from mouth to Lockport, Ill.	10, 391, 000	Under construction. Estimated cost to complete Authorized by Congress.
Pollution:		
Aledo, Antioch, Assumption, Astoria, Atlanta, Barry, Beardstown, Bensenville, Bloomington, Bourbonnais, Bradley, Bushnell, Canton, Carlinville, Carrollton, Cedar Point, Coal City, Crystal Lake, Cuba, Depue, Downers Grove, Dwight, East Dundee, East Peoria, Earlville, Elgin, Farmer City, Forrest, Galesburg, Galva, and Golden, Ill.; Goodland, Ind.; Hamilton, Itasca, Havana, Herscher, Jerseyville, Joliet, Kincaid, Lake Villa, LaSalle, Lemont, Lewistown, Lexington, Lincoln, Lockport, Manteno, Marseilles, Mason City, Mendota, Milford, Monence, Monticello, Mount Sterling, Morris, Morton, North Utica, Oglesby, Oswego, Ottawa, Palatine, Peotone, Pekin, Peru, Petersburg, Plainfield, Plano, Quincy, Rankin, Roberts, Rochester, Rockdale, Rushville, Saint Anne, Saodwich, Shabbona, Sibley, Soldiers Home, Springfield, Sprug Valley, Streator, Taylorville, Toluca, Toulou, Villa Park, Virginia, Washington, Watseka, Wauconda, Wenona, West Chicago, West Dundee, Westmont, Wheaton, Whitehall, Wilmington, Wyoming, and Yorkville, Ill.; Sewer extensions and/or sewage treatment plants.	19, 470, 000	
Alevis, Alpha, Ashland, Athens, Auburn, Avon, Bartonville, Benson, Biggsville, Bradford, Braidwood, Buckingham, Buckley, Bureau, Cerro Gordo, Chatham, Chatsworth, Chebanse, Chenoa, Cherry, Chillicothe, Cissna Park, Colchester, Colfax, Crescent City, Crotty, Cullom, Danforth, Deer Creek, Delavan, Divernon, Donovan, Eileen, Elburn, Elmwood, El Paso, Eureka, Fairbury, Flanagan, Forest View, Fox Lake, Frankfort, Gibson City, Gilman, Girard, Glasford, Grand Ridge, Grant Park, Granville, Greenfield, Gridley, Griggsville, Gurnee, Hardin, Hebron, Hennepin, Henry, Heyworth, Hinckley, Hopedale, Hull, Ipava, Joy, Keithsburg, Kempton, Kirkwood, Knoxville, La Harpe, Lake Zurich, Lamoille, Leland, LeRoy, Little York, Loda, London Mills, Loraine, Lostant, Mackinaw, Manhattan, Maroa, Mark, McLean, Metamora, Minier, Minooka, Mokena, Monee, Montgomery, Morrisonville, Mount Prospect, Mount Pulaski, Mowequa, New Holland, North Chillicothe, Odell, Onarga, Oquawka, Pawnee, Paw Paw, Payson, Pearl, Piper City, Plano, Rantoul, Roanoke, Roodhouse, Roseville, San Jose, Saunemein, Saybrook, Seaton, Secor, Sheldon, Somonauk, South Jacksonville, South Pekin, South Wilmington, Standard, Stobington, Strawn, Stronghurst, Subiette, Tiskilwa, Tremont, Vermont, Viola, Virden, Washburn, Waterman, Waynesville, Weldon, Wheeling, Williamsville, Winchester, Winfield, Woodhull and Woodland, Ill.; Sewer systems and sewage-treatment plants.	10, 138, 000	
Water supply:		
Abington, Addison, Aledo, Alevis, Algonquin, Arlington Heights, Assumption, Atlanta, Aurora, Avon, Barrington, Bartlett, Bartonville, Beardstown, Bensenville, Berkeley, Blue Mound, Bourbonnais, Bradley, Braidwood, Brookfield, Buckley, Bushnell, Cabery, Campus, Carlinville, Carpentersville, Carrollton, Cary, Cerro Gordo, Chatsworth, Chenoa, Chillicothe, Cissna Park, Clarendon Hills, Clinton, Coal City, Colfax, Crescent City, Crystal Lake, Cuba, Cullom, Dallas City, Danforth, Danvers, Delavan, Depue, Donovan, Downers Grove, Dwight, Earlville, East Dundee, East Peoria, Elburn, Elmhurst, Elmwood, El Paso, Eureka, Farmer City, Forrest, Fox Lake, Fox River Grove, Frankfort, Franklin Park, Galesburg, Galva, Gibson City, Gilman, and Glen Ellyn, Ill.; Goodland, Ind.; Grant Park, Grays Lake, Greenview, Griggsville, Hamilton, Hardin, Hebron, Henry, Herscher, Heyworth, Hillside, Hinckley, Hopedale, Hull, Ipava, Itasca, Jacksonville, Jerseyville, Joy, Keithsburg, and Kempton, Ill.; Kentland, Ind.; Kewanee, Kincaid, Kinsman, Kirkwood, Knoxville, Lacon, Ladd, LaGrange, La Grange Park, La Harpe, Lake Zurich, Lamoille, La Salle, Leland, Lemont, Le Roy, Lewistown, Lexington, Libertyville, Lincoln, Lockport, Lombard, London Mills, Lyons, Meckinaw, Macomb, Macon, Manhattan, Manteno, Maroa, Marseilles, Mason City, Maywood, McHenry, McLean, Melrose Park, Mendota, Metamora, Milford, Minier, Mokena, Monmouth, and Montgomery, Ill.; Morocco, Ind.; Morris, Morrisonville, Morton, Mount Prospect, Moweaqua, Mount Pulaski, Mount Sterling, Nauvoo, Nebo, Normal, North Chillicothe, North Utica, Onarga, Oquawka, Ottawa, Palatine, Pana, Pekin, Peoria, Peoria Heights, Peotone, Peru, Petersburg, Piper City, Plainfield, Plano,	4, 566, 000	

Upper Mississippi—Red River of the North Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Illinois—Continued.		
Water supply—Continued.		
Princeville, Rankin, Rantoul, Richmond, Riverside, Roanoke, Roberts, Rockdale, Roodhouse, Roselle, Roseville, Sandwich, San Jose, Saybrook, Schiller Park, Shabonna, Sheldon, Somonauk, South Jacksonville, South Pekin, South Wilmington, Stanford, St. Anne, St. Charles, Spring Valley, Stronghurst, Sublette, Table Grove, Taylorville, Toluca, Tremont, Villa Park, Viola, Virginia, Warsaw, Washburn, Washington, Waterman, Wenona, West Chicago, West Dundee, Westmont, Wheaton, White Hall, Wilmington, Winfield, Wyanet, and Wyoming, Ill.; Water treatment plants.		
Ashland, Athens, Augusta, Batavia, Bellewood, Berwyn, Blandinsville, Bloomington, Bluffs, Bowen, Bradford, Broadview, Brimfield, Camp Point, Canton, Chandlerville, Chapin, Chebanse, Cicero, Clayton, Clifton, Dalzell, DeLand, Des Plaines, East Galesburg, Edinburg, Elgin, Elliott, Elmwood Park, Fairview, Fisher, Forest Park, Forest View, Franklin, Gardner, Geneva, Golden, Gurnee, Hanna City, Hiosdale, Humphreys, Illiopolis, Industry, Joliet, Kane, and Kankakee, Ill.; Kouts, Ind.; Lodi, Ill.; Lowell, Ind.; Mahomet, Manito, Mansfield, Mazon, Meadow, Meredosia, Middletown, Momence, Murrayville, Naperville, New Berlin, New Boston, Niantic, and North Aurora, Ill.; North Judson, Ind.; North Riverside, Oak Park, Oglesby, Oneida, Palmyra, Park Ridge, Pleasant Hill, Plymouth, Pontiac, and Prairie City, Ill.; Remington, Ind.; River Forest, River Grove, Riverton, Rushville, St. David, South Elgin, Sparland, Spring Forest, Stickney, Streator, Summit, Tallula, Thayer, Tiskilwa, Tonica, Vermont, Versailles, Wapella, Warrensburg, Watseka, Wauconda, Waverly, Westchester, Williamsfield, and Yates City, Ill.: Water-supply systems.	$13,813,000	
Western tributaries Keokuk-Alton:		
Flood control:		
Fabius River drainage district, Marion County; Gregory drainage district, Lewis and Clarke Counties; Riverland levee district, St. Charles County; South River drainage district, Marion County; and Wiedmer chemicals drainage and levee district, St. Charles County, Mo.: Raising and enlarging existing leveo systems to improve protection against floods.	314,000	Authorized by Congress
Pollution:		
Bowling Green, Centralia, Clarence, Edina, Kirksville, Macon, Monroe City, Montgomery City, Palmyra, Shelbina, Troy, Wellsville, and Warrenton, Mo.: Improvement to the sewage-treatment plant.	639,000	
Canton, Hannibal, Louisiana, and La Belle, Mo.: Complete sewage treatment plant	208,000	
Elsberry, LaGrange, Memphis, New London, Oakwood, Paris and Perry, Mo.: Sewer systems and sewage-treatment plants.	365,000	
Water supply:		
Cantril and Pulaski, Iowa: Development of water supply and construction of distribution systems	67,000	
Centralia, Montgomery City, New London, Troy, Warrenton, and Vandalia, Mo.: Improvement to existing water supplies by chlorination.	214,000	
Elsberry and Oakwood, Mo.: Development of source of water supply probably by deep well and chlorination.	85,000	
Kahoka and La Belle, Mo.: Improvement to existing water supplies by treatment and chlorination	130,000	
Lancaster, Mo. and Milton, Iowa: Waterworks systems, including supply and distribution	90,000	
St. Louis:		
Drainage:		
Madison and St. Clair Counties, Ill.: Drainage, including control works, intercepting canals, and channel improvements in the East Side levee and sanitary district.	2,500,000	Preliminary plans completed.
Flood control:		
East St. Louis, Ill.: Raise and enlarge existing levees	1,158,000	Authorized by Congress.
Madison County, Ill. Raise and enlarge existing levees of the Chotean, Nameoki, and Venice drainage and levee district.	154,000	Do.
St. Louis, Mo.: Raise and enlarge existing levees of the St. Louis County drainage and levee district	279,000	Do.
Pollution		
Bendl, Ill.; Bonne Terre, Cuba, Desloge, Elvins, Esther, Flat River, and Leadwood, Mo.; Mount Olive, Ill.; Pacific, River Mines, St. Clair, St. James, and Salem, Mo.; Staunton, Ill.; Sullivan and Union, Mo.: Sewage treatment plants.	831,000	Preliminary plans completed.
Bismarck, Mo.: Sewer system and treatment plant	54,000	
Brooklyn, Ill.: Sewer system and pumping station	100,000	Do.
Caseyville and Signal Hill district, Ill.: Sewer system and sewage treatment plants.	150,000	Do.
Collinsville, Ill.: Sewer extensions and sewage treatment plant	160,000	Do.
Crystal City, Mo.: Extension of sewer system	25,000	Do.
East St. Louis, Ill.: Sewer system for Edgemont district	200,000	Do.
East St. Louis, Ill.: Sewer system for Lansdowns area in east part of the city	450,000	Do.
Edwardsville and Wood River, Ill.: Sewer system extensions	95,000	Do.
Granite City, Madison, Nameoki, and Venice, Ill.: Combined relief sewers and pumping station	3,000,000	Do.
St. Louis County, Mo.: Sewer system for Ladue-Deer Creek sanitary sewer district	435,000	Do.
St. Louis County, Mo.: Sewer system for the Lemay Ferry sanitary district	309,000	Petition pending to incorporate district.
St. Louis County, Mo.: Sewer system and sewage-treatment plant for the Overland sanitary sewer district	337,000	Subject to incorporation and bond issue election
University City, Mo.: Sewer system	159,000	Plans completed.
Webster Groves, Mo.: Extension of sewer system	200,000	Preliminary plans completed.
Wood River, Ill.: Combined sewers and pumping station	400,000	Preliminary plans partly completed.
Water supply		
Bendl, Ill.; Bonne Terre, Desloge, Elvins, Esther, Flat River, Leadwood, Pacific, Potasi, River Mines, St. Clair, St. James, and Salem, Mo.; Staunton, Ill.; Sullivan, Mo.; and Wood River, Ill.: Water supply improvement and/or treatment.	652,000	Preliminary plans completed and/or under study
Water supply:		
Bethalto, Brighton, Bunker Hill, Caseyville, Edwardsville, Gillespie, Glen Carbon, Maryville, Mount Olive, Roxana, Sawyerville, Wilsonville, and Worden, Ill.: Water supply systems.	1,070,000	Do.
Kaskaskia-Big Muddy:		
Flood control:		
Illinois: Levee construction. Protection of bottom lands	3,765,000	Authorized in part by Congress.
Pollution:		
Belleville, St. Clair County, Ill.: Extension of sewer system and additional treatment	1,576,000	Plans completed.
Benton, Franklin County, Ill.: Extension of sewer system and additional treatment	82,000	
Bethany, Carlyle, Findlay, Greenville, Lovington, Nokomis, Raymond, and Trenton, Ill.: Sewers and/or treatment plants.	165,000	
Carterville, Williamson County, Ill.: Sewer and sewage treatment plant	240,000	
Columbia, Monroe County, Ill.: Sanitary sewer system	65,000	
Elkville, Jackson County, Ill.: Sewer and sewage treatment plant	145,000	
Herrin, Williamson County, Ill.: Sewer and additional sewage treatment	685,000	
Maressa, New Athens, O'Fallon, Percy, Pocohontas, Ramsey, and Troy, Ill.: Sewers and sewage treatment plant.	489,000	
New Baden, Clinton County, Ill.: Sewer and sewage treatment plant	104,000	
West Frankfort, Franklin County, Ill.: Extension of sewers and sewage treatment plant	373,000	
Water supply:		
Ashley, Beckemeyer, Breese, Buckner, Carbondale, Carlyle, Cobden, Colp, Coulterville, Cutler, Elkville, Germantown, Livingston, Mulberry Grove, Okawville, Panama, Patoka, Percy, Pocahontas, Sandoval, Schram City, Sorento, Sullivan, Tamaroa, Taylor Springs, Tilden, Troy, Valier, Wamac, West City, and Willisville, Ill.: Water supply and/or improvements.	1,583,000	

Upper Mississippi—Red River of the North Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Kaskaskia—Big Muddy—Continued.		
Water supply—Continued.		
Ava, Evansville, Hammond, Hurst, Jonesboro, New Baden, and Pana, Ill.: Water supplies and improvements.	$475,000	Plans completed.
Freeburg, St. Clair County, Ill.: Development of source, treatment, and extension of system	122,000	
Marissa, St. Clair County, Ill.: Development of source and extension of distribution system	123,000	
Odin, Marion County, Ill.: Development of source and distribution system	102,000	
GROUP B—FOR DEFERRED CONSTRUCTION		
Red River of the North:		
Flood control:		
Lake Traverse—Bois des Sioux Reservoir for flood control, game refuge, and recreation	$1,400,000	Authorized by Congress.
Steele County Reservoir on Goose Pembina River for water conservation and flood control	195,000	
Walhalla Reservoir on Pembina River for flood control and water conservation	395,000	
Mouse-Devils Lake:		
Flood control:		
Minot, N. Dak.: Straighten and improve channel of Souris River	250,000	
Irrigation:		
Sand Hill Region, N. Dak.: Minor irrigation project for 2,000 acres. Wells and equipment for small individual farm projects.	100,000	
Recreation and wildlife:		
Rolette County, N. Dak.: Diversion ditch to Long Lake for wild-fowl conservation	5,000	
Water supply:		
Bartlett, Brinsmade, Churches Ferry, Crary, Devils Lake, Egeland, Hampden, Hansboro, Lakota, Leeds, Minnewaukan, Mylo, Penn, Perth, Rock Lake, and Starkweather, N. Dak.: Surveys and new wells.	30,000	
Rainy:		
Drainage:		
Big Falls Village, Borlin Creek, Little Fork River, Luoma Creek, Owens Township, Pike River, and Sturgeon Township, Minn.: Drainage by channel clearance.	67,000	
Mississippi headwaters:		
Pollution:		
Aitken, Albany, Annandale, Brainard, Calumet, Cambridge, Cass Lake, Cold Springs, Crosby, Deer River, Deerwood, Foley, Grand Rapids, Holdingford, Ironton, Keewatin, Long Prairie, Maple Lake, Melrose, Milaca, Monticello, Osakis, Paynesville, Princeton, Remer, Richmond, St. Joseph, Trommald, and Watertown, Minn.: Sewage treatment plants.	769,000	
Recreation and wildlife:		
Cass County, Minn.: Dams at Mud and Rice Lakes for wild fowl refuges	20,000	
Miscellaneous:		
Itasca County, Minn.: Dam for water conservation and stabilization of water levels of Sugar Lake	10,000	Would also serve as a refuge for waterfowl.
Minnesota:		
Flood control:		
New Ulm, Minn.: Dam on Minnesota River below the mouth of the Cottonwood River for flood control.	750,000	
Watonwan County, Minn.: 3 dams and 2 channel improvement projects for recreation and flood control.	126,000	Preliminary plans completed.
Pollution:		
Amboy, Blue Earth, Bricelyn, Butterfield, Canby, Easton, Hanley Falls, Henderson, Hendricks, Ivanhoe, Jordan, Lake Crystal, Lamberton, Le Center, Le Sueur, Madelia, Mankato, Mapleton, Minneota, Minnesota Lake, Montgomery, Mountain Lake, New Prague, North Mankato, Russell, St. Peter (and State institution), Sanborn, Shakopee, Sleepy Eye, Springfield, Starbuck, Tracy, Truman, Tyler, Wabasso, Walnut Grove, Welcome, Westbrook, Winnebago, Minn.: Sewage treatment plants.	1,005,000	
Bigstone City and Wilmont, S. Dak.: Sewers and sewage treatment plants	48,000	
Browns Valley, Chaska, Dawson, Gaylord, Good Thunder, Granite Falls, Hopkins, Janesville, Madison, Morris, Olivia, Redwood Falls, and Renville, Minn.: Sewage treatment plants.	304,000	
Millbank, S. Dak.: Sewers and sewage treatment plant	50,000	
Sisseton, S. Dak.: Sewage treatment plant	28,000	
Water supply:		
Rake, Iowa: Water supply system	25,000	
Miscellaneous:		
Lincoln County, Minn.: Dam for water conservation in Lake Hendricks	20,000	
Upper (Mississippi) eastern tributaries:		
Pollution:		
Alma Center, Amery, Augusta, and Bangor, Wis.; Barnum, Minn.; Barron, Black River Falls, Blair, Cadott, Cameron, Cashton, Colfax, Cornell, Cumberland, Durand, Ellsworth, Elmwood, Fairchild, and Fall Creek, Wis.; Forest Lake, Minn.; Fountain City, Galesville, and Gilldden, Wis.; Hinckley, Minn.; Independence, La Crosse, Ladysmith, Loyal, Menomonie, Merrillan, and Mondovi, Wis.; Moose Lake and Mora, Minn.; Neillsville and New Richmond, Wis.; North Branch, Minn.; North Hudson, Onalaska, Osceola, Owen, Park Falls, Pepin, Prairie du Chien, Onalaska, Prescott, Rice Lake, and River Falls, Wis.; Rush City and Sandstone, Minn.; Shell Lake, Sparta, Spooner, Spring Valley, and Stanley, Wis.; Taylors Falls, Minn.; Thorp, Viroqua, West Salem, and Whitehall, Wis.: Sewer systems and primary or secondary sewage treatment plants.	2,030,000	Plans completed
Askov, Minn.; Clear Lake, Hayward, and Hudson, Wis.; Mora, Minn.; and St. Croix Falls, Wis.: Sewage treatment plants.	83,000	
Centuria, Clayton, Cochrane, Greenwood, Luck, Mercer, Milltown, Phillips, Taylor, Turtle Lake, and Withee, Wis.: Sewers and sewage treatment plants.	200,000	
Chippewa Falls, Wis.: Primary sewage treatment plant	143,000	
Eau Claire, Wis.: Primary sewage treatment plant	394,000	
Water supply:		
Altoona, Boyceville, Centuria, Cochrane, Cornell, Fairchild, Fall Creek, Fountain City, Independence, Ladysmith, Merrillan, Neillsville, Pepin, Phillips, St. Croix Falls, Taylor, Trempealeau, Westby, and Whitehall, Wis.: Water-supply systems and water-treatment plants.	635,000	
Grantsburg, Hayward, Hudson, and Mercer, Wis.: Water supply systems and water treatment plants.	60,000	
Miscellaneous:		
Lakes: Bashaw, Briggs, and Devils, Burnett County; Duck, Barron County; Dunhem and Eagle, Burnett County; East Fork Rolling, Sawyer County; Eau Claire Lakes, Bayfield and Douglas Counties; Echo, Iron County; Fifield, Price County; Fisher Rolling, Iron County; Flambeau Rolling, Price County; Glen Flora, Rusk County; Grassy, Price County; Hawkins, Rusk County; Horseshoe, Barron County; Josie, Rusk County; Little Elk No. 1, Price County; Long and Loon, Burnett County; Mackey Brook, Washburn County; Middle, Rusk County; Mud, Burnett County, Ojibwa Rollings, Sawyer County; Ox Bow, Iron County; Parks Falls, Price County; Pas Wa Wong, Sawyer County; Pike Rolling, Iron County; Potato, Rusk County; Radigan, Douglas County; Raddison Rolling, Sawyer County; Rice, Iron County; Rice, Rusk County; Sand, Sawyer County; Shell, Washburn County; Silver Creek, Taylor County; Spider, Iron County; Squaw Creek, Price County; Taber, Burnett County; West Fork Rolling, Sawyer County; Weigoor, Rusk County; Wis.: Lake level control dams for water conservation.	270,000	

Upper Mississippi—Red River of the North Project List—Continued

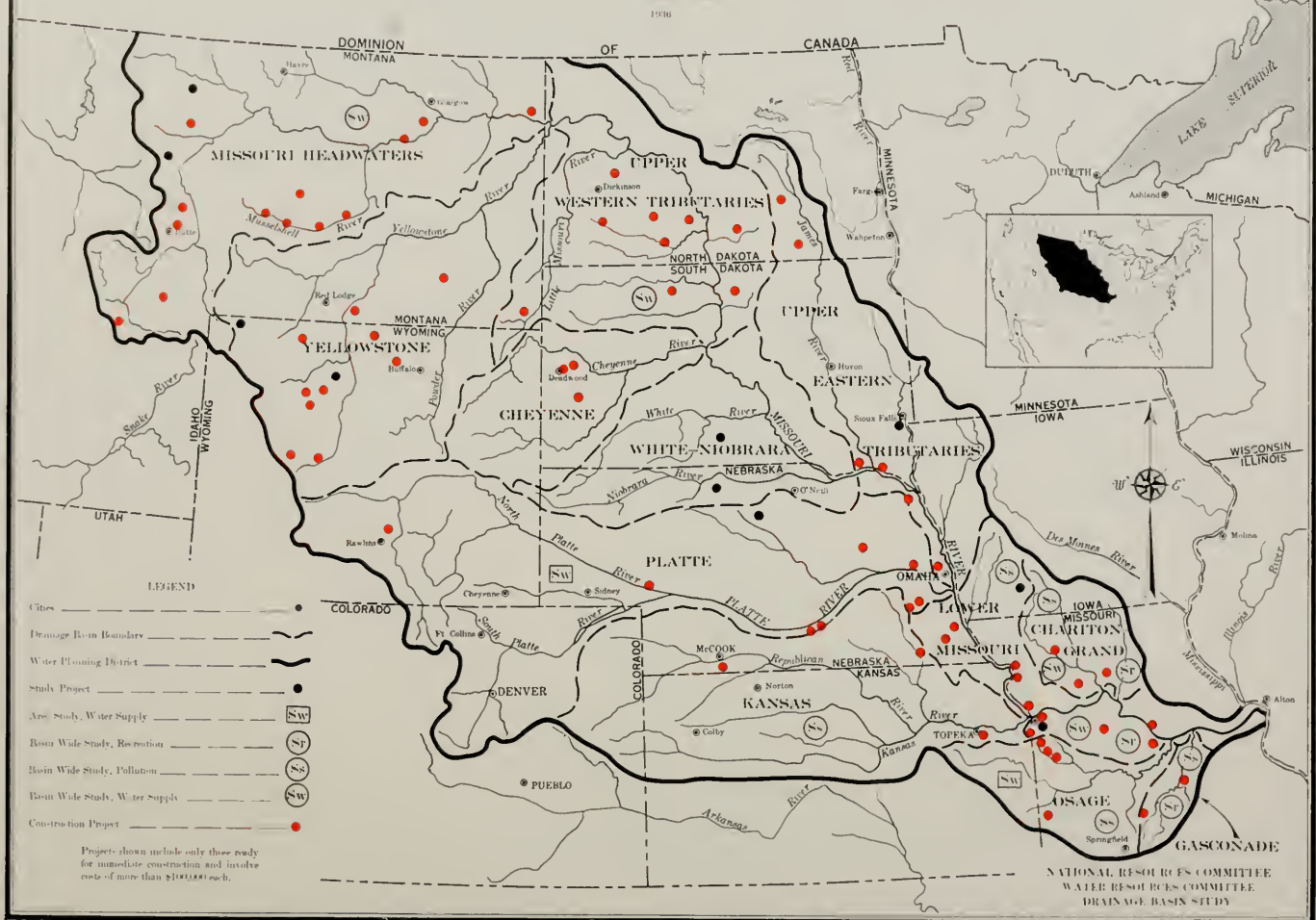
Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Upper (Mississippi) western tributaries:		
Pollution:		
Caledonia, Cannon Falls, Chatfield, Claremont, Dodge Center, Farmington, Hastings, Houston, Kasson, Kenyon, Lanesboro, Mabel, Mazeppa, Northfield, Pine Island, Preston, Red Wing, St. Charles, South St Paul, Spring Grove, Spring Valley, Stewartville, Wanamingo, Waseca, and Zumbrota, Minn.: Sewage-treatment plants.	$577,000	
Houston and Lewiston, Minn.; Oelwein and Olin, Iowa; Owatonna, Minn.; Oxford Junction and Waukon, Iowa: Secondary sewage-treatment plants.	810,000	
Wisconsin:		
Water power:		
Knowlton, Portage County; Little Eau Pleine, Marathon, and Portage Counties; Petenell and Table Rock, Adams County, Wis.: 4 dams and reservoirs on the Little Eau Pleine and Wisconsin Rivers.	14,300,000	Cost estimate for completion.
Water supply:		
Eagle River and Minnequa, Wis.: Water supply improvement	19,000	Rough cost estimate.
Rock:		
Pollution:		
Dixon, Ill.: Combined sewers	285,000	
Footville, Wis.: Sewage-treatment plant	10,000	
Rockford, Ill.: Sanitary sewers	137,000	
Water supply:		
Beloit, Wis.: Water-softening plant	200,000	
Iowa-Cedar:		
Erosion:		
Butler, Cedar, Cerro Gordo, Franklin, Winnebago, and Worth Counties, Iowa: Small dams and planting for bank protection, stream development, and provision for wildlife refuges.	70,000	
Mower County, Minn.: Improving banks of Cedar River, Dobbin Creek Lake, and Sutton Park Lake.	19,000	Preliminary plans only.
Pollution:		
Johnson County, Iowa: Storage dam on Iowa River above Iowa City to augment low water flow for pollution correction.	350,000	
Water supply:		
Albion, Britt, Cedar Rapids, Floyd, Garrison, Grafton, LeGrand, Montour, Nichols, Oakville, Princeton, Steamboat Rock, and Thornton, Iowa: Water-supply system or improvements.	463,000	
Des Moines-Skunk:		
Flood control:		
Ottumwa, Iowa: Des Moines River levees and channel alignment	600,000	Some work completed in protective works. Protection proposed as part of a sewage treatment plant system. Additional study and plans necessary.
Valley Junction, Iowa: Walnut Creek levee and channel alignment	25,000	Preliminary plans prepared. Petition submitted for formation of levee district in Valley Junction and Des Moines.
Pollution:		
Brighton, Nevada, and Story City, Iowa: Preliminary treatment plants	100,000	
Water supply:		
Agency, Barnes City, Batavia, Beacon, Birmingham, Blakesburg, Delta, Fremont, Keswick, Lacona, Lucas, Lynnville, Melrose, Menlo, Milo, Montrose, Moravia, New Virginia, Osceola, Runnells, Russell, St. Charles, Salem, Truro, Van Meter, Waukee, and What Cheer, Iowa: Water-supply system for development of supply and constructing distribution system.	1,035,000	No action taken. Surface supply is probable in most cases. Rivers available in several cases.
Illinois:		
Drainage:		
Vermilion County, Ill.: Drainage projects	29,000	Plans complete.
Flood control:		
Banner special drainage and levee district; Big Lake drainage and levee district; East Liverpool drainage and levee district; East Peoria drainage and levee district; Henderson County drainage district no. 3; Hennepin drainage and levee district; Keithsburg drainage and levee district, Mississippi River; Kelley Lake drainage and levee district; Lacey, Langellier, West Matanzas, and Kerton Valley drainage and levee district; Liverpool drainage and levee district; Lost Creek drainage and levee district; Pekin and La Marsh drainage and levee district; Rocky Ford drainage and levee district; Seahorn drainage and levee district; Sny Island levee district, Mississippi River; South Quincy drainage and levee district, Mississippi River; Spring Lake drainage and levee district and Thomson drainage district, Illinois: Levee (new or additional) and channel improvements on the Illinois River and that part of Mississippi River included in this report, for flood protection.	2,040,000	Authorized by Congress.
Irrigation:		
Green County, Ill.: Irrigation projects	29,000	Plans completed.
Pollution:		
Algonquin, Augusta, Bladensville, Bluemound, and Bluffs, Ill.; Bremen, Ind.; Brimfield, Ill.; Brook, Ind.; Burlington, Wis.; Cabery, Camp Point, Campus, Carbon Hill, Carthage, Cary, Chandlerville, Chapin, Cisco, Clayton, Clifton, Dallas City, Dalzell, Danvers, and De Land, Ill.; Earl Park, Ind.; East Galesburg, Edinburg, Elsah, Fairview, Farmersville, and Fisher, Ill.; Fowler, Ind.; Franklin, Gardner, Geneva, Grafton, Greenview, and Hanna City, Ill.; Hebron, Ind.; Humphreys, Iliopolis, Industry, and Kane, Ill.; Kentland, Ind.; Kewaunee and Kinsman, Ill.; Knox and Kouts, Ind.; Lake Geneva, Wis.; Lenore, Libertyville, and Lombard, Ill.; Lowell, Ind.; Macon, Mahomet, Manito, Mansfield, Mazon, Mendon, Meredosia, and Middletown, Ill.; Morocco, Ind.; Mukwonago, Wis.; Murrayville, Nauvoo, New Berlin, and New Boston, Ill.; New Carlisle, Ind.; Niantic, Ill.; North Judson and North Liberty, Ind.; Oneida and Palmyra, Ill.; Pewaukee, Wis.; Pittsfield, Pleasant Hill, and Plymouth, Ill.; Plymouth, Ind.; Prairie City, Ill.; Remington and Rensselaer, Ind.; Riverton, Shipman, South Elgin, Sparland, Spring Forest, Symerton, Tallula, Thayer, Tonica, and Versailles, Ill.; Walworth, Wis.; Wapella, Warrensburg, and Warsaw, Ill.; Waterford, Wis.; Waverly and West Dundee, Ill.; Westville, Ind.; and Wyanet and Yates City, Ill.: Sewer systems and sewage treatment plants.	5,107,000	
Water power:		
Kankakee River power development near Aroma Park, Ill	302,000	
Power development 2 miles below Wills-Kankakee County line in Illinois	1,473,000	
Kankakee River power development below Wilmington, Ill	624,000	
Water supply:		
Alpha, Astoria, Barry, Benson, Biggsville, Bureau, Cedar Point, Cisco, Decatur, Deer Creek, Elleen, and Elsah, Ill.; Fontana, Wis.; Glasford, Grand Ridge, Granville, Gridley, Havana, and Hennepin, Ill.; Knox and Lakeville, Ind.; Lake Geneva, Wis.; Little York, Loraine, Lostant, Mark, Minooka, Monee, New Holland, Odell, Oswego, Paw Paw, Payson, Pearl, Seaton, Secor, Shipman, Sibley, Standard, and Toulon, Ill.; Wankesha and Williams Bay, Wis.; Williamsville, Windsor, Woodhull, Woodland, and Yorkville, Ill.: Water supplies, improvements, and sewage treatment plants.	823,000	
Western Tributaries, Keokuk-Alton:		
Flood control:		
Adair County, Mo.: Channel improvement and dam construction for water diversion and storage	167,000	
Clark, Marion, and Pike Counties, Mo.: 3 flood-correction projects, levees, river improvements, etc.	76,000	

Upper Mississippi—Red River of the North Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Western Tributaries, Keokuk Alton—Continued.		
Flood control—Continued.		
Macon, Montgomery, Ralls, and Schuyler Counties, Mo.: 6 water conservation projects, dam construction and improvements and reservoir construction.	$75,000	
Clark County, Mo.: Diversion of lower Fox River to protect farm lands	60,000	
St. Louis:		
Flood control:		
Big, Bourboise, and Meramec Rivers, Mo.: Channel clearance for flood correction and recreation	20,000	
Madison County, Ill.: Improving levees of the Choteau Island drainage and levee district	213,000	
Madison County, Ill.: Levee construction for flood protection in the Wood River drainage and levee district.	131,000	
Pollution:		
Alton, Ill.: Sewer system in upper Piasa Valley	90,000	
Cahokia, East Carondelet, and Fairmount, Ill.; Herculaneum, Mo.; Nameoki, National City, and Washington Park, Ill., Sewer systems.	453,000	Preliminary plans completed
Deer Creek, Huntleigh, and Kirkwood, Mo.: Sewer systems	260,000	
East Alton, Ill.: Storm sewers	25,000	
St. Louis, Mo.: Sewers for area tributary to Gravois Creek, River Des Peres and Maline Creek	2,800,000	
St. Louis, Mo.: Sanitary relief sewer for River Des Peres district	1,000,000	
St. Louis, Mo.: Sewer replacements	260,000	
St. Louis, Mo.: Relief sewers	4,800,000	
University City, Mo.: Storm sewers and channel improvements for River Des Peres area	2,000,000	
Recreation:		
Alton, Ill.: Lake development above dam no. 26; beaches, boating facilities, drives and parks	1,250,000	
St. Charles County, Mo.: Lake development above dam no. 26 opposite Alton, Ill.—beaches, boating facilities, drives, and parks.	1,850,000	
Water supply:		
Meramec River Basin, Mo.: Storage reservoirs and low dams on tributaries for rural water supplies.	400,000	
Kaskaskia-Big Muddy:		
Drainage:		
Alexander, Franklin, Hamilton, Jackson, Perry, Randolph, St. Clair, Union, and Williamson Counties, Ill.: Drainage for malaria control.	700,000	
Pollution:		
Arthur, Ashley, Atwood, Ava, Beckemeyer, Bement, Buckner, Bush, Cambria, Carbondale, Central City, Coalton, Cobden, Coffeen, Colp, Coulterville, Cowden, Cutler, De Soto, Dowell, Energy, Farina, Freeburg, Germantown, Grand Tower, Hammond, Hanaford, Highland, Hillsboro, Hurst, Irving, Irvington, Johnston City, Jonesboro, Kinmundy, Lebanon, Livingston, Marine, Marion, Mascoutah, Mount Olive, Mount Vernon, Mulberry Grove, Murphysboro, North City, Odin, Okawville, Orient City, Pana, Panama, Patoka, Pinckneyville, Pittsburg, Royalton, St. Elmo, Sandoval, Schram City, Sesser, Shelbyville, Sorento, Steelville, Stewardson, Swansea, Tamaroa, Taylor Springs, Thompsonville, Tilden, Tower Hill, Valier, Vandalia, Wamac, West City, Williamson, Windsor, and Witt, Ill.: Sewers and sewage treatment plants.	5,137,000	
Water supply:		
Bush, Cambria, Carterville, Chester, Coalton, Coffeen, De Soto, Dowell, Energy, Farina, Grand Tower, Hanaford, Irving, Kinmundy, Lovington, Marine, Murphysboro, North City, Orient City, Pittsburg, Ramsey, Red Bud, Royalton, St. Elmo, Sesser, Shelbyville, Sparta, Stewardson, Thompsonville, Tower Hill, Trenton, Williamson, Windsor, Witt, and Ziegler, Ill.: Water supplies and improvements.	1,135,000	
Vandalia, Fayette County, Ill.: Additional treatment and additional water distribution	228,000	
West Frankfort, Franklin County: Water system	675,000	

MISSOURI BASIN

SCALE OF MILES



Provision of water for irrigation is uppermost among the water problems of the arid western third of the Missouri Basin. Adjustment of both water and land uses to recurring periods of drought is the pressing need of the semiarid middle section of the basin. Control of flood waters and abatement of pollution are outstanding problems in the subhumid easternmost third. Soil erosion is a serious problem in various localities of all three sections.

The irrigated valleys along the Rocky Mountain slope of the basin have prospered, in general, from the cultivation of sugar beet, vegetable and forage crops, but many of them have run short of water during recent years, and crop production has suffered sorely. Present supplies should be supplemented by additional surface storage and by transmountain diversion, with proper safeguards. Hydroelectric power installations may be combined profitably with new storage and diversion facilities in several instances. In the Jefferson, Marias, Musselshell, Gallatin, Yellowstone, and other northern tributary basins of the Missouri there is, in general, sufficient unappropriated water to allow storage adequate to care for all present needs and for some prospective needs. This is true of the Montana drainages above Fort Peck Dam if the Federal Government does not attempt to prevent further utilization of water upstream in order to maintain the flow of the Missouri River for navigation downstream. A number of relatively small reservoirs to provide supplemental water for existing enterprises are now feasible. Engineering and economic studies of proposed supplemental reservoirs, of a suggested Yellowstone-Missouri-Snake diversion, and of coordinated water-utilization programs in the Big Horn, Dearborn, and Marias Basins should be made promptly. Efficient utilization of grazing lands in the western area should be promoted by the recommended stock-watering improvements.

Water shortage is especially critical in the Platte Basin. Diversions from the Colorado Basin and storage reservoirs in the upper Platte Basin would prevent shortage in future and supply new enterprises as well, but new storage should not be undertaken until an equitable allocation of the waters of the North Platte River among Colorado, Nebraska, and Wyoming has been made, and until conflicts over available water in Nebraska have been reconciled.

Water conservation can at best play only a secondary role in the stabilization of economic life in the Great Plains section of the basin. It is an area of excessive risk in land use; an area in which the prevailing dry-farming and grazing systems always have failed in years of severe drought. Readjustments in cropping methods, land tenure, crop-insurance structure, and farm organization are necessary prerequisites to the establishment of an agricultural economy suited to withstand recurrent periods of deficient rainfall. The extent to which measures for the use and control of water may contribute to improvement of Great Plains conditions is summarized in the following paragraphs:

1. Small dams may be constructed in certain areas devoted to grazing in order to make water available for stock on range lands that otherwise could not be grazed, or to reduce the distance which livestock must be trailed to water.

2. Springs may be improved, shallow wells may be dug, and deep wells may be drilled to supply water for livestock in favorable areas. The effect of the foregoing measures (both 1 and 2) would be to reduce overgrazing near water holes, and so to extend the effective range area.

3. In grazing areas having adequate supplies of stock water, unappropriated water may, where topographic and soil conditions permit, be stored and used for the irrigation of forage crops, thus building up feed reserves for dry years. The available surface supplies of water are meager, however, since only 5 percent of the scanty rainfall normally reaches the main river system.

4. In areas to be devoted mainly to dry farming, there are opportunities to irrigate scattered tracts of small size, in most cases, from reservoirs or by pumping. The importance of such work cannot be large in the aggregate. It is estimated that only 3 percent, at most, of the total Great Plains area can ever be irrigated at reasonable cost.

5. Construction of reservoirs for recreational use and for wildlife conservation and provision of wells for domestic use would measurably increase the comfort of Great Plains occupance but would not affect the basic problem of wresting a living from the hazardous semiarid environment.

6. Large irrigation projects are not considered feasible in most parts of the semi-arid plains because they do not yield substantial benefits in wet years and so fall into disuse. Moreover, large projects almost invariably develop independently of and yield slight benefits to dry-farming activities on adjacent lands.

Specific programs of works for the Little Missouri, Cheyenne, James, and intervening basins are shown in the accompanying tables. In general, small reservoirs

should be undertaken only after the completion of surveys indicating an economic use for the stored water, safe foundations for the dams, adequate spillway capacities, and drainage areas sufficient to supply water during dry years.

The most urgent water problem in the eastern subhumid section of the basin is the elimination of the flood hazard at the Kansas Citys and in the lower Kansas River Basin. Studies of alternative plans for protection are nearing completion and a final plan probably will be made available during 1937. Flood control is of local importance also at a few places in the Osage and Grand Basins, and the need for reduction of Missouri River and lower Mississippi flood flows may in future warrant reservoirs on the Osage, Gasconade, and Grand Rivers. At present there is immediate justification for improvements of sanitary facilities at the commercial cities along the Missouri and in the Ozark recreational areas. The navigation project now under construction on the Missouri does not merit extension.

Missouri Basin Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Missouri Basin, general:		
Irrigation:		
Investigation of small-scale projects in Great Plains area	$150,000	
Missouri headwaters:		
General:		
Study to determine extent and best use of water supply of the Dearborn River, Mont	25,000	
Study to determine extent and best use of water supply of the Marias River, Mont	50,000	
Yellowstone:		
Irrigation:		
Yellowstone-Missouri-Snake diversion project	150,000	
General:		
Big Horn River Basin, plan of development	50,000	
Platte:		
General:		
Study of water supply and use in Colorado, Wyoming, and Nebraska	100,000	Needed as basis for selection of projects.
Blue River diversion, Summit County, Colo.: Study of economic feasibility of diversion from Colorado Basin to Missouri Basin.	25,000	In progress. Sum needed to complete.
Kansas:		
Pollution:		
Study of pollution throughout basin	20,000	
Miscellaneous:		
Study of pasture ponds throughout basin	10,000	
Lower Missouri:		
Pollution:		
Kansas City, Kans., and Kansas City, Mo.: Study of sewage treatment	20,000	
Study of stream pollution throughout basin	10,000	
Recreation and wildlife:		
Study of recreation, reforestation, soil conservation, and wildlife facilities of basin	50,000	
Water supply:		
Study of water supply for municipal, domestic, and livestock use throughout basin	10,000	
Chariton-Grand:		
Pollution:		
Study of stream pollution throughout basin	10,000	
Recreation and wildlife:		
Study of water conservation and recreation	20,000	
Osage:		
Pollution:		
Study of stream pollution throughout basin	10,000	
Water supply:		
Study of water supply for municipal, domestic, and livestock use in western section of basin	20,000	
Gasconade:		
Pollution:		
Study of stream pollution conditions throughout basin	5,000	
Recreation and wildlife:		
Study for extension of recreational facilities of basin	5,000	
2. Construction Projects		
Missouri headwaters:		
Flood control:		
Glasgow, Mont.: Levees on Milk River for flood protection	26,000	Sketch plans completed.
Harlem, Mont.: Levees on Thirty Mile Creek for flood protection	10,000	Do.
Havre, Mont.: For completion of Chain of Lakes Reservoir by Fresno Dam on Milk River to conserve and utilize flood waters imported from the St. Mary River.	250,000	Sum needed to complete.
Saco, Mont.: Levees on Beaver Creek for flood protection	27,000	Sketch plans completed.
Irrigation:		
Ackley Lake, Mont.: Increased water storage by raising natural outlet of lake, and to fill same by feed canal (3 miles long) from Judith River for irrigation supply.	98,000	Plans nearly ready.
Barber, Mont.: Outlet tunnel from Deadman's basin to return water to the river to supply lower Musselshell canals.	300,000	Inlet tunnel from Musselshell River under construction. Sum needed to complete.
Durand, Forks, and Martinsdale, Mont.: Reservoirs for irrigation	400,000	Cost given is for first 2 years. Additional needed to complete, $376,000.
Fairfield, Mont.: Sun River Project canals and drains to complete system	400,000	Cost given is for first 2 years. Additional needed to complete, $500,000.
Fort Belknap Indian Reservation, on Milk River, Mont.: Improvements to present irrigation system	30,000	Storage in Chain of Lakes included with Milk River Project. Plans completed. Cost given is for first 2 years. Additional needed to complete, $30,000.
Madison County, Mont.: Storage reservoir on Ruby River for irrigation of lands in Ruby and Jefferson Valleys.	527,000	Plans completed.
Montana: Small reservoirs in several counties costing less than $25,000 each, for irrigation and grazing including Little Dry Creek, Buffalo Hill, Ash Creek, and Clear Lake.	250,000	Plans are incomplete.
Saco, Mont.: Saco Divide Pumping Division of the Milk River project for irrigating 10,000 acres of land above gravity system.	400,000	Plans in preparation. Cost given is for first 2 years. Additional needed to complete, $600,000.
Upper Boulder, Mont.: Dam to provide supplemental storage for irrigation	200,000	

Missouri Basin Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A.—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Missouri headwaters—Continued.		
Irrigation and water supply:		
Fort Peck, Indian Reservation, Mont.: Missouri River pumping plant for stabilizing supply for several units on reservation.	$100,000	Cost given is for first 2 years. Additional needed to complete, $100,000.
Jordan, Mont.: Big Dry Creek storage reservoir to be used in conjunction with Wolf Creek Reservoir for irrigation purposes. It would also serve town of Jordan.	80,000	Plans nearly ready.
Navigation:		
Fort Peck Mont.: Fort Peck Dam on the Missouri River for stabilizing flow for navigation below Sioux City.	16,297,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $2,922,000.
Pollution and water supply:		
Helena, Mont.: Stand-by water service for veterans' hospital and Fort Harrison, including 300,000-gallon reservoir, and extension of present water and sewer systems.	35,000	Surveys started.
Water supply:		
Helena, Mont.: Water mains	379,000	
Lewiston, Mont.: Water mains	238,000	
Montana: General water supply development consisting of wells, springs, and reservoirs for stock grazing throughout State.	250,000	Survey to be made.
Miscellaneous:		
Dell, Mont.: Big Sheep Creek Reservoir for supplemental storage in Red Rock Valley	136,000	
Yellowstone:		
Irrigation:		
Big Horn and Powder River Basins, Mont.: Small reservoirs	200,000	Plans can be completed quickly.
Crow Indian Reservation, Mont.: Irrigation systems	300,000	Cost given is for first 2 years. Additional needed to complete, $200,000.
Gooseberry Reservoir, Wyo.: Storage	197,000	
Grass Creek Reservoir, Wyo.: Supplemental storage	100,000	
Heart Mountain Division, Shoshone project, Wyo.: Irrigation	4,500,000	Sum necessary to complete.
Louis Lake Reservoir, Wyo.: Supplemental storage	31,000	
Owl Creek, Wyo.: Irrigation district; supplemental supply	325,000	
Riverton irrigation project, Wyo.	750,000	Cost given is for first 2 years. Additional needed to complete, $3,100,000.
Shell Irrigation project, Wyo.: Additional storage	55,000	
Sidney, Mont.: Pumping project	85,000	Plans nearly completed.
Tensleep Meadows Reservoir, Wyo.: Storage	48,000	
Tongue River, Mont.: Storage	820,000	Plans in progress.
Miscellaneous:		
Entire basin: General water development for grazing	250,000	
Upper (Missouri) western tributaries:		
Irrigation:		
Carter County, Mont.: Storage on Box Elder Creek	67,000	Plans ready.
Carter County, Mont., Little Missouri River: Storage and irrigation canals	778,000	Ready for contract.
Pollution:		
Ashley, Beach, Belfield, Beulah, Bowman, Golva, Dickinson, Elgin, Glen Ullin, Hazen, Hebron, Hettinger, Killdeer, Linton, Marmarth, Max, Mott, Napoleon, New England, New Salem, Ray, Richardton, Stanley, Strasburg, Turtle Lake, Watford City, Wild Rose, Wilton, and Wisbek, N. Dak.: Municipal sewer systems.	1,045,000	Plans can be completed quickly for all projects except Hettinger.
Gettysburg, Glenham, Herreid, Java, and McIntosh, S. Dak., and New Leipzig, N. Dak.: Municipal sewer systems.	141,000	Plans ready for Java. Plans incomplete for New Leipzig. No plans for other projects.
Goodrich, Grenora, Hazelton, Lehr, Marshall, Plaza, Ryder, Sanish, Tioga and Underwood, and Zeeland, N. Dak.: Municipal sewer systems.	375,000	Plans can be completed quickly.
Recreation and wildlife:		
Steele, N. Dak.: Long Lake Bird Refuge	66,000	Plans completed.
Water supply:		
Akaska, Glenham, S. Dak.; Goodrich, Grenora, Hazelton, N. Dak.; Herreid, Hoven, Lebanon, S. Dak.; Lehr, Linton, Parshall, N. Dak.; Pollock, S. Dak.; Ryder, Sanish, Stanley, Tioga, Underwood, Washburn, Wilton, and Zeeland, N. Dak.; Municipal water-supply systems.	525,000	Plans can be prepared quickly for projects in North Dakota. Plans ready for Herreid, S. Dak. No plans for other projects.
Ashley, Bowman, Glen Ullin, Max, Napoleon, New Salem, Ray, Richardton, Strasburg, Turtle Lake, Wild Rose, Wisbek, and 22 other towns in North Dakota, and Java, S. Dak.: Water-supply systems and/or wells.	480,000	Plans can be completed quickly for all projects. Plans ready for Java.
Mandan, N. Dak.: Water-treatment plant	115,000	Plans can be completed quickly.
New Leipzig, N. Dak.: Water distribution system and treatment plant	30,000	Plans incomplete.
Upper (Missouri) eastern tributaries:		
Navigation:		
Missouri River—Omaha, Nebr., to Sioux City, Iowa: Completion of present 6-foot channel project	23,000,000	Authorized by Congress.
Pollution:		
Decatur, Nebr.; Denison, Iowa; Dixon County, Nebr.; Dow City and Duolap, Iowa; Edgely and Ellendale, N. Dak.; Fessenden, N. Dak.; Faulkton, S. Dak.; Hartington, Nebr.; Kulm and La Moure, N. Dak.; Missouri Valley, Iowa; Montrose, S. Dak.; Oaks, N. Dak.; Omaha, Nebr.; Plankinton, S. Dak.; South Sioux City, Nebr.; Streeter, N. Dak.; Walthill, Nebr.; Watertown, S. Dak.; Woodbine, Iowa: Sewer systems and sewage treatment plants.	3,238,000	Plans available for South Dakota projects. Plans for North Dakota projects can be completed promptly. Iowa and Nebraska plans incomplete. Iowa costs are rough estimates on per capita basis.
Recreation and wildlife:		
19 small reservoirs in James River drainage in North Dakota for stock watering, waterfowl, and recreation.	196,000	Plans can be completed quickly.
Water supply:		
Blair, Nebr.; Brandt, S. Dak.; Canton, S. Dak.; Deloit, Iowa; Huron, S. Dak.; Jackson, Nebr.; Jefferson, S. Dak.; Kiron, Iowa; Knox County, Nebr.; Kulm, N. Dak.; Lennox, S. Dak.; Maskell, Nebr.; Mitchell, S. Dak.; Omaha, Nebr.; Streeter, N. Dak.; Thurston, County Nebr.; Tripp, Valley Springs, and Vermillion, S. Dak.; Wall Lake and Woodbine, Iowa; Yankton, S. Dak.: Water-supply systems, construction, improvement, or treatment.	638,000	Nearly all plans made. Iowa plans incomplete. All estimated costs very approximate; many on per capita basis.
Miscellaneous:		
James River dam: Water conservation	484,000	$384,000 of this amount for land purchase.
4 small reservoirs in South Dakota—construction or repairs	15,000	Plans ready.
Cheyenne:		
Irrigation:		
Niobrara and Weston counties, Wyoming: Constructing 4 dams and reservoirs to provide storage of water for irrigation purposes.	25,000	Plans nearing completion.
Irrigation and water supplies:		
Indian reservations, South Dakota: Improvements to water systems for domestic use, stock, and irrigation purposes.	50,000	Preliminary plans completed. Cost given is for first 2 years. Additional needed to complete, $50,000.
Pollution:		
Sturgis, S. Dak.: Sewage-disposal plant	136,000	Plans completed.
Recreation and wildlife:		
Wind Cave National Park, S. Dak.: Diversion dam and pipe line to fill dry lake bed for recreational purposes and to supply water for game refuge.	30,000	Preliminary plans made.
Water supply:		
Edgemont, Deadwood, Nisland, Sanator, South Dakota State School of Mines, Vale, Wall, and Whitewood, S. Dak.: Improvements to water-supply systems.	191,000	Preliminary plans completed.
Rapid City, S. Dak.: Improvements to water-supply system	125,000	Plans completed.

Missouri Basin Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
White-Niobrara:		
Irrigation:		
Whitney irrigation district, Nebraska Reservoirs for supplemental storage	$81,000	Plans are ready.
Pollution:		
Burke, Midland, New He-Dog School, Philip, Pine Ridge Agency, Pukwana, and Wagner, S. Dak.: Sewer systems and sewage-treatment plants for each of several communities in Nebraska	167,000 275,000	Plans can be completed quickly.
Water supply:		
Armour, Belvidere, Fort Pierre, Hammill, Kadoka, Kennebec, Lake Andes, Midland, Oacoma, Onida, Pine Ridge Agency, Platte, Reliance, White River, and Winner, S. Dak.: Water supply for municipal distribution systems for each of above 15 communities.	368,000	Further investigation of all projects necessary.
Water supply for domestic and stock use on Indian reservations in South Dakota	50,000	
Water supply for municipal developments for each of several communities in Nebraska	377,000	Plans can be completed quickly.
Platte River		
Irrigation:		
Goshen County, Wyo.: Ray Reservoir on Horse Creek to furnish supplemental water supply for 10,640 acres.	315,000	
Development of wells, springs, and storage facilities for stock watering on the public range in several counties in Platte basin in Wyoming.	75,000	
Irrigation and power:		
Casper-Alcova project, Wyoming	2,000,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $4,800,000.
Platte Valley public power and irrigation district ("Sutherland"): Power and irrigation project on North Platte River in Lincoln County, Nebr.	465,000	Nearly completed. Sum given is rough estimate of additional amount necessary to complete. This sum already allotted subject to compliance with certain conditions. Total cost estimated at $10,165,000.
Central Nebraska public power and irrigation district ("Tri-County"): Project on Platte River in central Nebraska.	3,000,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $17,000,000. Certain construction pertaining to power is restrained temporarily pending court hearing. Adjustments to irrigation plans may be necessary because of recent court decisions.
Water power:		
Loup River public power district ("Columbus"): Power project on Loup River, Platte County, Nebr.	5,200,000	Under construction. Certain construction pertaining to transmission lines is restrained temporarily pending court hearing. Sum given is rough estimate of additional amount necessary to complete. Total cost estimated at $16,200,000.
Pollution:		
Arlington, Broadwater, Columbus, Fremont, Fullerton, Kearney, Lincoln, Meadow Grove, Norfolk, North Bend, Ogallala, Oshkosh, Osmond, Overton, Sargent, Schuyler, Stanton, Wayne, West Point, and Wolbach; Dixon and Lancaster Counties, Nebr.: Sewer systems and/or sewage treatment.	905,000	
Brighton, Fort Lupton, Fort Morgan, Colo.: Sewer systems	64,000	
Lincoln, Nebr.: Sewage channel to Platte River	200,000	Plans can be completed quickly.
Water supply:		
Albany County, Wyo.: Near Pole Mountain, reconstruction of water system	16,000	
Albion, Alliance, Alvo, Bridgeport, Bruno, Clarks, Columbus, Craig, Elba, Ericson, Fremont, Hickman, Hyannis, Kearney, Madison, Norfolk, O'Neill, Overton, Page, Pender, Prague, Rockville, Sargent, and Tilden; Knox and Thurston Counties, Nebr.: Waterworks extensions.	632,000	
Castle Rock, Central City, Frederick, Fort Morgan, Golden, Idaho Springs, Keenesburg, La Salle, Louisville, Loveland, and Nederland, Colo.: Municipal water supplies.	251,000	Plans incomplete.
Erie and Lafayette, Colo.: Municipal water supplies	142,000	
Intercepting ditches on Ranch Creek and St. Louis Creek in Grand and Boulder Counties, Colo., to provide additional water for diversion through Moffat tunnel.	2,250,000	Surveys in progress.
Kansas:		
Pollution:		
Bertrand, Elwood, McCook, and Superior, Nebr.: Sewage disposal plants	161,000	Plans completed.
Campbell, Davenport, Hastings, Imperial, Indianola, Osceola, Seward, and Sutton, Nebr.: Sewer systems.	344,000	Do.
Cheyenne Wells and Flagler, Colo.: Sewer systems and sewage treatment plants	49,000	Do.
Nelson and Superior, Nebr.: Storm sewers	43,000	Do
Topeka, Kans: Sewer extensions and improvements	307,000	Do.
Water supply:		
Alma, Beatrice, Nebr.; Cheyenne Wells, Colo.; Dwight, Exeter, Grainton, Nelson, Nebr.; Olathe, Kans.; Stockville and Swanton, Nebr.: Waterworks improvements	318,000	Do.
Clifton, Delia, Dorrance, Ellis, Fort Riley, Lebanon, Leonardville, Longford, McLouth, Paleo, Eudora, Shawnee, Soldier, Vermillion, Wallace, and Wetmore, Kans.: Municipal water supplies.	689,000	Do.
Kansas City, Kans.: Waterworks improvement	200,000	Do.
Topeka, Kans.: Waterworks improvement	219,000	Do.
Lower Missouri		
Drainage:		
Richardson County, Nebr. Channel enlargement, Big Nemaha River, for drainage improvement	252,700	
Navigation:		
Omaha, Nebr., to mouth of Missouri River: Construction of navigation channel of 6 foot depth	9,200,000	Sum needed to complete present project.
Pollution:		
Adams, Nebr.; Anita and Atlantic, Iowa; Booneville, Burlington Junction, California; and Carrollton, Mo.; Carson and Clarinda, Iowa; Columbia, Concordia, and Elden, Mo.; Elliott and Essex, Iowa; Excelsior Springs and Fairfax, Mo.; Farragut, Iowa; Fayette, Fulton, Gilliam, and Glasgow, Mo.; Glenwood, Griswold, and Hamburg, Iowa; Hermann, Higginsville, Hopkins, Independence, Jefferson City, and King City, Mo., Lennox, Iowa; Lees Summit, Lexington, Liberty, and Maryville, Mo.; Melvern, Iowa; Mound City, Mount Washington, New Franklin, New Haven, Norborne, North Kansas City, Odessa, Oregon, Pilot Grove, and Plattsburg, Mo.; Red Oak, Iowa, Richmond, Rockport, and Sedalia, Mo.; Shenandoah, Iowa; Skidmore, Slater, Smithville, St. Charles, St Joseph, Sugar Creek, Sweet Springs, Tarkio, and Tipton, Mo.; Villisca, Iowa; Warrensburg, Washington, and Weston, Mo.: Sewage treatment plants.	3,278,000	
St. Joseph, Mo.: Sewage system	930,000	
Water supply:		
Belton, Booneville, Burlington Junction, California, and Concordia, Mo.; Corning, Iowa; Elden Excelsior Springs, Fulton, and Hermann, Mo.; Lennox, Iowa; Lexington, Maitland, Marshall, Mound City, New Franklin, New Haven, Norborne, North Kansas City, Oregon, Richmond, Skidmore, Sweet Springs, Tipton, and Washington, Mo.: Water treatment plants.	627,000	
Atlantic, Avoca, Defiance, Elkhorn, Elliott, Glenwood, Hastings, Hamburg, Lewis, Oakland, and Pacific Grove, Iowa; Pilot Grove, Mo; Riverton, Silver City, and Templeton, Iowa: Waterworks systems and improvements.	288,000	
Kansas City, Mo.: Improvements to waterworks system	527,000	

Missouri Basin Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Chariton and Grand:		
Pollution:		
Afton, Iowa; Albany, Bevier, Breckenridge, Brunswick, Bucklin, Cainsville, Cameron, Chillicothe, Mo.; Corydon, Iowa; Gallatin, Grant City, Green City, Hamilton, Huntsville, Keytesville, La Plata, Linneus, Maysville, Milan, Novinger, Pattonsburg, Princeton, Salisbury, Trenton, and Unionville, Mo.: Sewage treatment plants.	$767,000	Preliminary plans completed.
Braymer, Mo.: Sewer system and sewage treatment plant	49,000	Plans ready.
Water supply:		
Allerton and Murray, Iowa: Municipal water supplies	133,000	
Bethany, Cameron, and Marceline, Mo.: Improvement of water supplies	215,000	
Bevier, Braymer, Breckenridge, Bucklin, Cainsville, Green City, Linneus, Novinger, and Pattonsburg, Mo.: Municipal water supplies.	348,000	
Osage:		
Pollution:		
Appleton City, Ash Grove, Bolivar, Buffalo, Camdenton, Clinton, Cole Camp, Drexel, Eldorado Springs, Greenfield, Harrisonville, Humansville, Iberia, Liberal, Lockwood, Marshfield, Nevada, New Linn Creek, Osceola, Pleasant Hill, Rich Hill, Sheldon, Stockton, Versailles, Warsaw, Westphalia, and Windsor, Mo.: Sewage-treatment plants.	923,000	Final plans needed.
Arcadia, Eskridge, Gardner, Louisburg, Moran, Mound City, Pomona, Quenemo, Scranton, and Waverly, Kans.: Sewer systems and sewage-treatment plants.	314,000	Do.
Mulberry, Kans.: Sewer system and sewage-treatment plant	70,000	Do.
Osawatomie, Kans.: Sewage-treatment plant	65,000	Do.
Recreation and wildlife:		
Near Nevada, Mo.: Waterfowl refuge	96,000	Plans being prepared.
Water supply:		
Drexel, Mo.; Eskridge, Kans.; Fair Play, Garden City, Liberal, and Hume, Mo.; Louisburg, Kans.; New Linn Creek, Mo.; Pomona, Quenemo, and Scranton, Kans.; Sheldon, Mo.; Spring Hill, Kans.; Tuscumbia and Westphalia, Mo.: Water-supply systems.	310,000	Final plans needed.
Harrisonville, Mo.; Melvern, Kans.; Morrisville and Pleasant Hill, Mo.: Addition to water-supply system.	329,000	
Gasconade:		
Pollution:		
Cabool, Houston, Mountain Grove, and Richland, Mo.: Sewage-treatment plants	255,000	Final plans required.
Pollution and water supply:		
Crocker, Hartville, Lane, Licking, Newburg, and Waynesville, Mo.: Municipal water-supply systems and sewage-treatment plants.	155,000	Do.
GROUP B—FOR DEFERRED CONSTRUCTION		
Missouri headwaters:		
Irrigation:		
Bainville, Mont.: Supplemental supplies from Little Muddy and Shot Gun Creeks for irrigation	$254,000	Plans nearing completion.
Beaverhead County, Mont.: Dam on Red Rock Creek to provide supplemental water supply for irrigation.	860,000	
Daniels County, Mont.: Storage reservoir for irrigation on East Fork Poplar River	205,000	Requires clearance of rights from Fort Peck Indian Reservation. Plans nearing completion.
Havre, Mont.: Beaver Creek storage for irrigation	184,000	Plans incomplete.
Jefferson County, Mont.: Diversion project, water to be stored at Beaverhead Rock Dam for irrigation of Pipestone benchlands.	200,000	Do.
Plentywood, Mont.: Reservoir on Upper Big Muddy for irrigation	476,000	
Richland, Mont.: Storage reservoir for irrigation purposes on West Fork Poplar River	359,000	Requires clearance of rights from Fort Peck Indian Reservation. Plans nearing completion.
Townsend, Mont.: Broadwater-Missouri dam and reservoir for irrigation	250,000	Plans not complete. Cost given is for first 2 years. Additional needed to complete, $870,000.
Recreation and wildlife:		
Medicine Lake, Mont.: Migratory waterfowl refuge; additional water development	15,000	Should not conflict with principal uses of water.
Yellowstone:		
Drainage:		
Drainage on irrigation projects in Yellowstone and Clarks Fork Valleys	350,000	To be planned as required.
Irrigation:		
Buffalo Rapids project, Custer County, Mont	1,000,000	Cost given is for first 2 years. Additional needed to complete, $5,100,000.
Wind River Indian Reservation, Wyo.: Storage	100,000	Cost given is for first 2 years. Additional needed to complete, $1,205,000.
Upper (Missouri) western tributaries:		
Irrigation:		
Montana, North Dakota, South Dakota: Small reservoirs for stock water and irrigation on Knife River, Heart River, Cannonball River, Grand and Moreau Rivers. Minor tributaries of Missouri River.	250,000	Plans can be prepared quickly. Cost given is for first 2 years. Additional needed to complete, $750,000.
Upper (Missouri) eastern tributaries:		
Navigation:		
Sioux River channel improvement from Elmwood Park to Brandon, Minnehaha County, S. Dak.	240,000	Plans ready.
Pollution:		
Alexandria, Alpena, Beresford, Bristol, Canton, Dell Rapids, Flandreau, Flandreau Industrial School, Frederick, Groton, Hartford, Humboldt, Iroquois, Leola, Mount Vernon, Plankinton, Roscoe, School District No. 3, Tripp, Vermillion, Volga, Waubay, Willow Lakes, and Woonsocket, S. Dak.: Sewer systems and/or sewage-treatment plants.	561,000	Plans available for Flandreau.
Recreation and wildlife:		
McCook County, S. Dak.: Ramsey Lake recreation project, in Vermillion River drainage	154,000	Plans prepared.
6 recreational lakes in Big Sioux and Vermillion Basins, S. Dak.	54,000	Plans available for 2. No plans for others.
Water supply:		
Aberdeen, Northern Normal School, Brandt, Bruce, Carthage, Castlewood, Clifton School District No. 4, Cresbord, Flandreau Industrial School, Florence, Goodwin, Humboldt, Langford, Letcher, Roscoe, Roswell, Seneca, unnamed place, and Volga, S. Dak.: Water-supply systems.	215,000	Plans available for Florence, Castlewood, Bruce, and Flandreau Industrial School. No plans for others.
Bowdon, Cathay, Cleveland, Courtenay, Ellendale, Fessenden, Gackle, Hamberg, Kensal, Kulm, Ludden, Medina, Montpelier, Monango, Pingree, Streeter, and Verona, N. Dak.: Wells for municipal water supply.	22,000	Plans can be completed quickly.
Sioux Falls, S. Dak.: Addition to filtration plant	300,000	No plans.
Miscellaneous:		
Small reservoirs for water conservation in Nebraska	200,000	Plans incomplete.
54 reservoirs for water conservation at various places in South Dakota	500,000	Plans available for 18 of these projects. No plans for others. Cost given is for first 2 years. Additional needed to complete, $681,000.
Cheyenne:		
Flood control:		
Belle Fourche, Hermosa, Hot Springs, Keystone, New Underwood, Rapid City, and Spearfish, S. Dak.: Small reservoirs and improvements for flood control.	29,000	Partial plans only.

Missouri Basin Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Cheyenne—Continued.		
Irrigation:		
Belle Fourche, S. Dak.: Supplemental storage for Belle Fourche Irrigation project	$100,000	Investigations under way. Plans not completed. Cost given is for first 2 years. Additional needed to complete, $300,000.
Butte, Custer, Meade Counties, S. Dak.: Small reservoirs, wells, and tanks for watering stock	150,000	Preliminary plans only. Cost given is for first 2 years. Additional needed to complete, $150,000.
Irrigation and power.		
Rapid City, S. Dak.: Dam and reservoir for storage and power on Pactola project and to supplement irrigation water below Rapid City.	100,000	Preliminary plans only. Cost given is for first 2 years. Additional needed to complete, $2,900,000.
Pollution:		
Belle Fourche, Deadwood, Edgemont, Lead, Newell, Spearfish, Wall, and Wasta, S. Dak.: Sewage-treatment plants and sewer systems.	129,000	
Recreation and wildlife:		
Belle Fourche, S. Dak.: Water control structures and fencing of Belle Fourche Migratory Waterfowl Refuge.	22,000	Plans completed
Custer and Pennington Counties, S. Dak.: 13 reservoirs for storage of water and recreational purposes. All small except Beaver Creek, $100,000.	179,000	Do.
Water supply:		
Ardmore, Fairburn, Oelrichs, Owanka, Quinn, Rapid City, Sturgis, Wall, Wasta, and Whitewood, S. Dak.: Improvements and exteasions to the water-supply systems.	300,000	Preliminary plans only
White-Niobrara:		
Flood control:		
Midland and Philip, S. Dak.: Small flood-control projects	20,000	
Irrigation:		
Small reservoirs in various locations in Nebraska	125,000	Plans can be completed quickly
Stock watering dams for each of 39 individual projects in South Dakota	150,000	
Pollution:		
Avon, Delmont, Draper, Gregory, Kennebec, Lake Andes, Onida, Pukwana, Quinn, Rosebud, Winner, and White River, S. Dak.: Sewer systems.	105,000	Each of these projects should be investigated before funds are allocated to them.
Recreation and wildlife:		
Bonesteel (dam), Delmont (city lake), Lake Burke (spillway), Oacoma (ditch), Sully County (diversion to fill dry lake), Sully Lake, and Witten (dam), S. Dak.: Recreational projects in these 7 locations.	61,000	
Recreational and wildlife refuge projects in various localities in Nebraska	150,000	Some projects are ready for immediate construction. Nebraska State Planning Board is recommended to program same into individual projects.
Water supply:		
Burke, Delmont, Draper, Murdo, and Pierre, S. Dak.: Municipal water supplies	152,000	Further study of these projects necessary.
Water supply and recreation:		
Storage projects for the combined purpose of recreation and increased percolation to ground water for domestic and stock water use in 38 localities in South Dakota.	400,000	
Platte:		
Irrigation.		
Colorado-Big Thompson transmountain diversion of water from Colorado Basin to Missouri Basin for supplemental irrigation supply.	3,000,000	Fessible and badly needed to supply water for lands now under cultivation. Estimate includes a definite provision for compensating reservoirs fully sufficient to protect rights of water users on western slope. Cost given is for first 2 years. Additional needed to complete, $22,000,000.
Frances March McDonald Reservoir on Horse Creek, in Goshen County, Wyo., for supplemental irrigation supply.	450,000	Further study needed.
8 small storage projects for irrigation in Wyoming	72,000	Plans can be completed quickly.
Garden County, Nebr.: Blue Creek public power and irrigation district project	400,000	Plans incomplete.
Pollution:		
Arvada, Central City, Deer Trail, Fort Collins, Georgetown, Golden, Idaho Springs, Johnstown, Julesburg, Kersey, La Salle, Longmont, Loveland, Merino, Mountain View, Ovid, and Platteville, Colo.: Sewage treatment plants.	274,000	Do.
Lower Missouri:		
Pollution:		
Hardin, Higbee, Overland, St. Ferdinand, and Waverly, Mo.: Sewage treatment plants	202,000	
Kansas City, Mo.: Sewage treatment plant	3,000,000	
Water supply:		
Blockton, Clearfield, College Springs, Prescott, and Gravity, Iowa; Hardin and Higbee, Mo.; New Market, and Orient, Iowa; St. Ferdinand, Overland, and Waverly, Mo.: Municipal water supply systems.	494,000	
Chariton-Grand:		
Flood control:		
Flood levees for such land units as may be protected at relatively low cost	225,000	
Water supply:		
Exline, Garden Grove, Grand River, Kellerton, Lineville, Lorimor, Numa, Tingley, and Van Wert, Iowa: Water supply systems.	377,000	Improvements of supplies.
Cincinnati and Mystic, Iowa: Water supply systems.	220,000	

SOUTHWEST MISSISSIPPI BASINS

(Basins of the Arkansas, White, Black, and St. Francis)

The Arkansas River is a typical "through river", possessing dissimilar characteristics in its upper, middle, and lower sections, each of which presents distinctive water problems.

1. Its headwaters rise at altitudes of some 14,000 feet in the Rocky Mountains amid heavy snows and under abundant rains. It flows eastward from the mountains across the semiarid Great Plains, losing volume on the way. Its principal tributary, the Canadian, has similar attributes. Most of the smaller streams tributary to the upper Arkansas and the upper Canadian are on the high plains and are flashy. These headwater streams contribute practically no sustained flow to their eastern extensions.

The prime water need of the upper section of the basin is more water for lands now irrigated. More water may be made available by further conservation of existing supplies and by transmountain diversion from drainage on the western slopes of the Rocky Mountains. Storage of water on the Canadian River, in New Mexico, ultimately will put under irrigation some 60,000 acres, most of which is new land. Proposals for storing floodwaters on the Cimarron in New Mexico and Oklahoma involve smaller irrigation developments, which, if used for production of forage and subsistence crops, may harmonize satisfactorily with the best comprehensive land-use economy.

2. The middle Arkansas flows through the gently rolling prairie plains of eastern Kansas and Oklahoma. The lower Canadian, lower Cimarron, Neosho, and Verdigris tributaries rise rapidly and flood good agricultural lands several times a year during periods of thunderstorms. The middle section of the basin, with its diversified industries and relatively concentrated population, has important problems of providing an adequate urban water supply and insuring stream flow regulation for sanitary purposes.

3. The lower Arkansas occupies a broad flood plain in a trough entrenched in the rugged hilly area between the Boston and Ouachita Mountains. Here there are problems similar to those of the middle basin, and, in addition, the problems of serious and frequent floods. Tributaries of the lower Arkansas afford numerous opportunities for the development of recreational facilities and of hydroelectric power.

The White, Black, and St. Francis Rivers rise in the Boston Mountains and Ozark Plateau. A considerable part of their base flow comes from large springs. Violent rains on the steep rocky slopes cause numerous floods. These basins possess many beauty spots for recreational development, and several power sites for development in an integrated power system. The extensive tracts of rocky wooded hills with their numerous watercourses are potential game and wildlife refuges.

The regional plan formulated to meet the foregoing conditions and problems may be summarized as follows:

1. In the Rocky Mountain and Great Plains sections the available water resources would be completely conserved and applied primarily to crop production in a grazing economy, but with full consideration of the urban water supply and sanitary needs. The consummation of such a plan would also correct flood flows, reduce soil erosion, and improve recreational facilities.

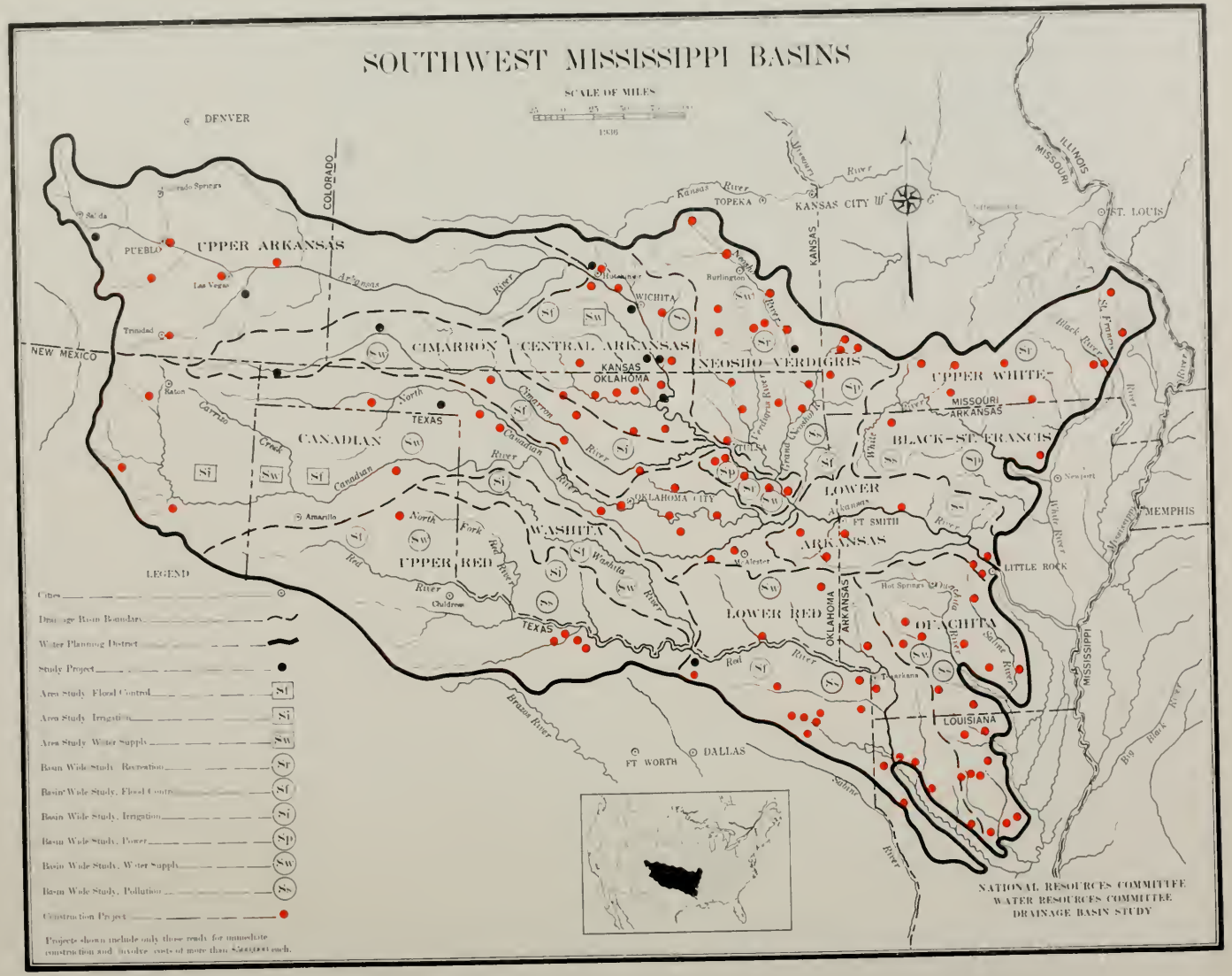
2. In the Prairie Plains and the lower Arkansas Basin an ample and reliable sustained flow would be secured in the main stream and the principal tributaries through storage of flood waters, thus making available a water supply of satisfactory quantity and quality for urban centers. Such a development would so reduce the frequency of floods on the bottom lands that it would be unnecessary to provide complete protection by levees, except for small areas of high value.

3. In both the Prairie Plains and lower Arkansas Valley sections complete protection from great and infrequent floods is not practicable for agricultural lands any more than it would be for urban property in connection with municipal storm drainage.

4. On the streams of the Ozark uplift, hydroelectric power will ultimately be developed in large blocks, but for a long time the cost of such power, if used for base-load purposes, will exceed that of equivalent steam-power production from gas and oil and even from coal. Such projects should be developed when it proves economical to use hydroelectric power for peak-load purposes in large interconnected systems.

5. In the sandy shifting channel of the Arkansas River, projects cannot be carried out that would provide water transportation except at a cost far greater than that of transportation by other means.

The foregoing matters are reflected in the list of projects. Proposals are there made for further study of several dams authorized by the Congress and for additional reservoirs. It is suggested that these reservoirs be fitted to a program of water control that would improve low water stream flow and reduce the frequency of floods. Hydroelectric power production is proposed on the Verdigris-Neosho-Illinois systems.


SOUTHWEST MISSISSIPPI BASINS
SCALE OF MILES
1936
DENVER
COLORADO
PUEBLO
UPPER ARKANSAS
Las Vegas
Trinidad
NEW MEXICO
Raton
CIMARRON
CENTRAL ARKANSAS
NEOSHO-VERDIGRIS
KANSAS
OKLAHOMA
TOPEKA
KANSAS CITY
ILLINOIS
MISSOURI
ST. LOUIS
WICHITA
Burlington
Neosho River
Verdigris River
Grand (Neosho) River
UPPER WHITE
MISSOURI
ARKANSAS
Black River
St. Francis River
TEXAS
CANADIAN
Carrizo Creek
Cimarron River
Canadian River
OKLAHOMA CITY
Amarillo
BLACK-ST. FRANCIS
White River
Newport
MEMPHIS
LOWER
ARKANSAS
FT SMITH
WASHITA
North Fork Red River
Red River
Washita River
Arkansas River
LITTLE ROCK
Hot Springs
Ouachita River
Saline River
LOWER RED
OUACHITA
Texarkana
LOUISIANA
Big Black River
MISSISSIPPI
Quitman
Childress
FT WORTH
DALLAS
Sulphur River
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Study Project
Area Study Flood Control (Sf)
Area Study Irrigation (Si)
Area Study Water Supply (Sw)
Basin Wide Study Recreation (Sr)
Basin Wide Study Flood Control (Sf)
Basin Wide Study Irrigation (Si)
Basin Wide Study Power (Sp)
Basin Wide Study Water Supply (Sw)
Basin Wide Study Pollution (Ss)
Construction Project
Projects shown include only those ready for immediate construction and involve costs of more than $100,000 each.
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

In this drainage area the underground water resources of the Texas high plains are at present adequate for municipal supplies and for supplementary application through pumping for improvement of agricultural production, but in some sections the water is not fit for drinking purposes, because of its high fluoride content.

Below the high plains escarpment, rainfall is inadequate for satisfactory crop production. The streams have high flood-flow peaks and are nearly or quite dry during long periods in summer. Storage is needed to make water available for supplementary application to maturing crops on lands now under cultivation, for improvement of very unsatisfactory urban water supplies, and for improvement of stream flow for sanitary purposes. Such storage may reduce appreciably the frequency of flooding of fertile lands.

For the part of the basin below Denison, Tex., there is ample rainfall for crops, but the valley lands are flooded so frequently as to impair greatly their value. In this section, flood flows on the tributaries are more damaging than in the western area, but, as in the west, the streams dwindle and disappear in summer. There is a definite deficiency of surface water for urban supplies in various localities and a seriously unsanitary condition in the streams every summer. Storage of water is indicated for correction of low water stream flow on the tributaries, and for reduction of the frequency with which valley lands are flooded. In certain areas reservoirs for these purposes would have further value for production of water power and for recreation.

Studies by the Corps of Engineers demonstrate clearly that the cost of producing reliable conditions for navigation on the Red River above Shreveport would be far in excess of any prospective benefits. Accordingly navigation alone is not considered as a possible part of a long-range water plan. The same studies also show that protection of agricultural lands and of improvements on the lowlands against great and infrequent floods could be secured only at a cost far in excess of benefits. It appears, however, that the best use of the fertile bottom lands is impaired to much greater extent by frequent overflow from small and moderate floods than by great floods, and it is thought that the cultivation of these lands can be stabilized reasonably well if the frequency of overflow is reduced from once in 1 or 2 years, the present situation, to once in 5 years. The best form of protection is through detention reservoirs; it may be flexible as to the degree secured. There is urgent need for an engineering investigation of a possible system of relatively small reservoirs in the upper parts of the tributary valleys, supplemented by local channel improvements of moderate scope. The investigation should determine whether or not such a system could be operated to reduce the frequency of flooding to the extent suggested. The recent drought indicated clearly that conservation of flood water in the part of the area above Denison is essential to the establishment of good sanitary conditions and to the best use of agricultural lands.

For the section below Denison, a similar type of water improvement is indicated, except that no supplemental water is needed for agricultural purposes. These statements apply also to the lower part of the Washita Basin. In the Ouachita Basin, additional water storage and stream-flow regulation are needed somewhat urgently, and if combined with the development of hydroelectric power they may be warranted in the near future. Water-storage projects in parts of the Little River and Kiamichi Basins should provide for ultimate production of hydroelectric energy.

There apparently is a need for flood protection on the Sulphur River. It will require channel and floodway improvement, possibly supplemented by the impounding of flood waters.

The plan outlined in preceding paragraphs is tentative. An extensive and detailed engineering investigation will be required to determine whether or not it is feasible in all its phases.

In the Red River Basin as a whole there is need for the improvement of municipal water-supply facilities and for the installation and extension of sewage-treatment works.

The extension of forests on the submarginal areas of the uplands would have important value for the long-range water plan. There is definite need for the wider practice of soil-conservation measures on cultivated lands and for the improvement of the vegetal cover on other lands over much of the area. Reduction of soil erosion would simplify the operation of water-conservation facilities. Recommendations with respect to these collateral needs and problems are made elsewhere.

Southwest Mississippi Basins Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Arkansas (general):		
Studies: (1) In the Cimarron and Canadian sub-basins to determine reservoir developments to achieve the best flow regulation for irrication, augmentation of low flows, reduction in frequency of overbank flows and water supplies; (2) of the Central Arkansas, Verdigris, Neosho (Grand), and Illinois Rivers with special emphasis on multiple use reservoirs for flow regulation, water supply, water power, or recreation; (3) to determine what changes could be made in the design or operation of flow regulation projects in other sub-basins to increase benefits to the Lower Arkansas without materially lessening the local benefits; a determination of the benefits primarily to the main stem of possible reservoir projects on the Poteau, Petit Jean, and Fourche La Fave Rivers; a determination of levee projects which might supplement the reservoirs.	$825,000	All these studies are to determine what combination of projects and operation will attain a considerable increase in low flows and a material reduction in frequency of overbank flows. All studies of tributary reservoirs should include consideration of any incidental benefits to the lower Arkansas.
Upper Arkansas:		
Flood control:		
Study to determine measures for flood control on the Apishapa, Cuchara, Huerfano, and Purgatoire Rivers in Colorado.	100,000	Authorized by Congress. In addition to studies now being made by Bureau of Reclamation.
Irrigation:		
Colorado River-Arkansas River diversion: Study to determine the practicability and desirability of diverting the headwaters of the Gunnison and Frying Pan Rivers to the Arkansas River Basin and the feasibility of Tennessee Pass tunnel for irrigation.	215,000	Study in progress.
Cimarron:		
Flood control, recreation, and wildlife:		
Study of possible sites for small reservoirs for flow correction, water supply, and recreation	10,000	
Study of lake in Grant County, Kans., to determine its usefulness in flood correction in connection with its primarily intended use for recreation and wildlife conservation.	5,000	
Canadian:		
Irrigation:		
Study of possibilities of irrigation systems corollary to Optima and Fort Supply Reservoirs in Texas, Beaver, and Woodward Counties, Okla.	50,000	
Central Arkansas:		
Pollution:		
Arkansas City and Hutchinson, Kans.; Ponca City, Okla.; Wichita and Winfield, Kans.: Study and preparation of plans for sewage treatment plants.	25,000	
Study of salt-water disposal in the oil fields in Kansas and Oklahoma	25,000	
Study of stream pollution in Kansas and Oklahoma	20,000	
Study of ground-water resources in Kansas and effects of oil brines	10,000	
Neosho-Verdigris:		
Pollution:		
Study and survey of sources and extent of stream pollution in Kansas, Oklahoma, and Missouri	20,000	Quantitative knowledge of pollution is seriously lacking.
Lower Arkansas:		
Pollution:		
Study of stream pollution to ascertain its extent and character and to make recommendations	15,000	
Upper White-Black-St. Francis:		
Pollution:		
Study to determine the extent and source of stream pollution throughout the basin	25,000	
Recreation, wildlife, and water power:		
Study to determine the relative values of water resources for power or recreation throughout the basin.	15,000	
Upper Red River:		
Irrigation and water supply:		
Studies of reservoirs throughout the subbasin in Oklahoma and Texas for water supply, irrigation, and flow regulation; including a study of methods to minimize silting in reservoirs.	175,000	These studies may indicate the desirability of altering the proposed Denison project.
Pollution:		
Study and survey of stream pollution in Texas and Oklahoma. Chemical and biological analyses of surface water to determine extent and seriousness of pollution. Should include fluoride analyses.	[1] 25,000	
Washita:		
Flood control, irrigation, pollution, and water supply:		
Study of proposed plan to construct 25 reservoirs on tributaries of Washita River for flood control, irrigation, water supply, and maintenance of adequate dry-season flow for dilution of sewage and other wastes, in the Washita Basin, Oklahoma.	180,000	
Irrigation:		
Study of practicability of irrigation in the basin in Oklahoma and Texas	50,000	
Lower Red:		
Flood control and water power:		
Arkansas, Louisiana, Oklahoma, and Texas; Blue River, Boggy Creek, Kiamichi River, Little River, Sulphur River, Cypress Creek, Bayou Bodcau, and Bayou Dorcheat: Study of reservoirs for partial flood control in connection with water power.	200,000	
Study of reservoir possibilities at Denison, Tex., in connection with tributary reservoirs in the basin, for flood control and power.	50,000	Further development of studies now in progress, under authority of 1936 Flood Control Act.
Pollution:		
Pollution survey in Arkansas, Louisiana, Oklahoma, and Texas	20,000	
Water supply:		
Atoka, Bryan, Choctaw, and Coal Counties, Okla.; Fannin and Hunt Counties, Tex.; Johnston, Latimer, Le Flore, and McCurtain Counties, Okla.; Miller County, Ark.; Pittsburg and Pushmataha Counties, Okla.; Sevier County, Ark.: Study of small water-conservation projects.	25,000	For summer supply in areas lacking adequate ground water.
Ouachita:		
Pollution and water supply:		
Studies to collect and analyze data on water resources to draw up a water plan, including consideration of sanitation and water supply.	80,000	
2. Construction Projects		
Upper Arkansas:		
Flood control and irrigation:		
Taylorville, Colo.: Earth dam and reservoir at the Caddon site on the Arkansas River for flood control and to supplement water supply for irrigation.	10,000,000	Plans near completion. Authorized by Congress.
Irrigation:		
Chivington, Colo.: Completion and rehabilitation of the Chivington Public Irrigation District	80,000	Plans completed.
Hugo, Colo.: Diversion dam on Big Sandy Creek, reservoir, and canals for the Hugo Public Irrigation District.	180,000	Preliminary plans made.
Las Animas, Colo.: Rehabilitation of Apishapa Public Irrigation District by replacement of dam which failed in flood.	300,000	Plans completed. Appurtenant works completed
Pollution:		
Bazine, Kans.; Buena Vista, Camp Martin, Canon City, Cripple Creek, Eads, Florence, Fountain, Fowler, Holly, La Junta, Lamar, Las Animas, Manzanola, Monument, Rocky Ford, Salida, Sugar City, Victor, and Wiley, Colo.: Sewage-treatment plants for partial or complete treatment.	396,000	Plans completed.
Pueblo, Colo.: Complete sewage-treatment plant	500,000	Do.
Walsenberg, Colo.: Complete sewage-treatment plant	50,000	Do.

[1] Per year.

Southwest Mississippi Basins Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Upper Arkansas—Continued.		
Water supply:		
Camp Martin and Kit Carson, Colo.: Water supply systems	$40,000	Plans completed. Camp Martin project authorized by Congress.
Canon City, Colorado Springs, and La Junta, Colo.; Lakin, Kans.; Lamar and Manzanola, Colo.; Ness City, Kans.; Rocky Ford, Swink, and Trinidad, Colo.: Improvements and repairs to water supply systems.	190,000	Preliminary plans made.
Colorado and Kansas: Approximately 4,500 small farm ponds throughout the basin	655,000	Rough preliminary plans only; further study to disclose location and type.
Cimarron:		
Pollution:		
Carmen, Fairview, Hennessey, Jennings, Oilton, O'Keene, Stillwater, Waynoka, and Yale, Okla.: Sewer system improvements and/or sewage-treatment plants.	109,000	
Guthrie, Okla.: Sewage treatment plant	150,000	
Water supply:		
Buffalo, Okla.; Enid, Okla.; Goltry, Okla.; Kismet, Kans.; Langston, Okla.; Meade, Kans.; O'Keene, and Stillwater, Okla.; Water supply systems or improvements.	616,000	Preliminary plans made.
Canadian:		
Drainage:		
Hughes County, Okla.: Drainage for farm lands	84,000	Awaits authorization.
Lincoln County, Okla.: Drainage for farm lands	72,000	Do.
Mora County, N. Mex.: Eradication of malarial mosquito breeding areas by fill and drainage	32,000	
Flood control:		
Texas County, Okla.: Optima Reservoir on Beaver River	1,530,000	Authorized by Congress. Irrigation study recommended in A-1.
Woodward County, Okla.: Fort Supply Reservoir on Wolf Creek	2,585,000	Do.
Flood control, irrigation, and water supply:		
Tucumcari, N. Mex.: Conchas Dam and Reservoir	6,500,000	Under construction. Estimated cost is amount necessary to complete project.
Irrigation:		
Colfax County, N. Mex.: Completion of Miami Dam to insure cultivation of about 6,500 acres of fertile farm land.	60,000	Preliminary plans and surveys made. Approximately $50,000 already spent by farmers' development company.
Colfax County, N. Mex.: Dam and reservoir at Maxwell site for storage of waste water and for irrigation purposes.	23,000	Plans completed.
La Cueva, N. Mex.: Earth fill dam on the Mora River for retantion of floodwaters	91,000	Plans completed. Core drillings have been made.
Mora County, N. Mex.: Improvement of Colmar irrigation system	23,000	Plans completed.
Pollution:		
Ada, Chandler, and Jones City, Okla.: Improvements to sewage systems and sewer treatment plants.	210,000	
Allen, Beaver, Blanchard, Depew, Eufaula, Haileyville, Hartshorne, Konawa, McAlester, McLoud, Morris, Norman, and Purcell, Okla.; Roy, N. Mex.; Seminole, Shattuck, Stratford, Thomas, Watonga, Weleetka, Wewoka, and Woodward, Okla.: Improvements to sewer systems and sewage treatment plants.	448,000	
Shawnee, Okla.: Sewage treatment plant	250,000	No treatment facilities at present.
Water supply:		
McAlester, Okla.: Water supply improvements	193,000	Preliminary plans made.
Oklahoma City, Okla.: Improvements to supplement present supply	1,000,000	
Whitedeer, Tex.: Water supply system	9,000	Do.
Central Arkansas:		
Flood control, recreation, and wildlife:		
Alfalfa County, Okla.: Great Salt Plains Reservoir on Salt Fork River for flood control and wildlife refuge.	1,233,000	Project authorized by Congress.
Pollution:		
Alva, Cherokee, Cleveland, Shidler, and Tonkawa, Okla.: Complete sewage treatment plants	180,000	
Arkansas City, Kans.; Ponca City, Okla.; Winfield, Kans.: Complete sewage treatment plants	550,000	
Attica, Burrton, Galva, and Mount Hope, Kans.; and Pawnee, Okla.: Sewer systems and/or sewage treatment plants.	234,000	Preliminary plans made.
Blackwell, Billings, Kaw City, Pond Creek, and Ralston, Okla.: Improvements to existing sewage treatment plants.	61,000	
Hutchinson, Kans.: Extensions to sewer system	120,000	Do.
Hutchinson, Kans.: Complete sewage treatment plant	400,000	
Wichita, Kans.: Secondary sewage treatment plant	1,000,000	
Water supply:		
Ava, Lamont, and Nash, Okla.: Waterworks or waterworks improvements	55,000	
Arkansas City, Kans.: New water supply	751,000	Do.
Braman, Okla.: Dam and storage reservoir for water supply of Blackwell, Okla	50,000	Money needed for completion of a project already underway.
Eldorado, Kans.: Improvements to waterworks system	144,000	Preliminary plans made.
Fairfax and Ralston, Okla.: Improvements to existing waterworks systems	115,000	
Hutchinson, Kans.: Improvements to waterworks system	1,422,000	Do.
Isabel, Kans.; Kaw City, Okla.; Lorraine, Mount Hope, and Norwich, Kans.; Osage, Okla.; Sharon and Sylvia, Kans.: Waterworks systems or improvements to existing systems.	360,000	Do.
Perry, Okla.: Improvements to existing waterworks system	210,000	Do.
Neosho-Verdigris:		
Drainage:		
Ottawa, Tulsa, and Wagoner Counties, Okla.: Malaria control	689,000	
Flood control:		
Osage County, Okla.: Dam and reservoirs at Hulah site on Caney River for flood control and stream stabilization.	2,343,000	Authorized by Congress.
Pollution:		
Afton, Okla.; Alba, Mo.; Altamont and Altoona, Kans.; Anderson, Mo.; Arma and Buffalo, Kans.; Carl Junction and Carterville, Mo.; Cherokee, Kans.; Claremore and Collinsville, Okla.; Colony, Kans.; Commerce, Okla.; Decatur, Ark.; Edna and Elk City, Kans.; Gravette, Ark.; Hartford, Kans.; Hominy, Okla.; Jasper, Mo.; LaHarpe, Kans.; Lanagan, Mo.; Lebo and Longton, Kans.; Marionville, Mo.; McCune and Mound Valley, Kans.; Neck City, Neosho, and Noel, Mo.; Nowata, Okla.; Oronogo, Mo.; Peru, Kans.; Picher, Okla.; Pierce City and Pineville, Mo.; Pryor, Okla.; Purcell, Mo.; Rogers, Ark.; Sarcoxie, Mo.; Seammon, Kans.; Seneca, Mo.; Severy, Kans.; Skiatook Okla.; Southwest City, Mo.; Strong and Treece, Kans.; Wagoner, Okla.; Webb City, Mo., and White City, Kans.: Sewer systems and/or primary, secondary, or complete treatment plants or reconditioning of existing systems.	1,138,000	Rough estimated cost, with allowance for possibility that some of the projects may not be constructed.
Chanute, Kans.; Joplin and Lamar, Mo.; LeRoy, Kans.; Lincoln, Prairie Grove, and Sulphur Springs, Ark.; Vinita, Okla.: Sewage-treatment plants.	636,000	
Pollution and water supply:		
St. Paul, Kans., and Springdale, Ark.: Waterworks and sewer system for the former: extensions to sewer system for the latter.	81,000	

Southwest Mississippi Basins Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Neosho-Verdigris—Continued.		
Water supply:		
Altamont, Americus, Buffalo, and Chautauqua, Kans.; Copan and Dawson, Okla.; Dearing, Kans., Diamond and Duenwege, Mo.; Dunlap, Durham, Dwight, Edna, Elk Falls, and Fall River, Kans., Goodman, Mo.; Grenola, Gridley, Havana, Hepler, Lebo, Lehigh, Liberty, and Lincolnville, Kans.; Miller, Mo.; Neosho Falls, Neosho Rapids, and Olpe, Kans.; Purdy and Seligman, Mo.; Siloam Springs, Ark.; Sperry, Okla.; Tampa, Thayer, Tyro, and Wilsey, Kans.: Complete water supply systems or extensions.	$458,000	Rough estimated cost, with allowance for possibility that some of the projects may not be constructed.
Barnsdall and Catoosa, Okla.; Cherryvale, Kans.; Golden City and Joplin, Mo.; Le Roy, Kans.; Monett, Mo.; Mound Valley, Kans.; Oronogo and Pineville, Mo.; Salina, Okla.; Severy, Kans.; Southwest City, Mo.; Springdale, Ark.; Strong, Kans.; Vinita and Wagoner, Okla.; Walnut and White City, Kans.: Waterworks, improvements, extensions, or construction to secure additional supply.	733,000	
Chanute, Eureka, and Fredonia, Kans: Filtration or water treatment plants	216,000	
Greenwood County, Kans.: Dam and reservoir near town of Fall River on Fall River for stream flow stabilization, for improvement of municipal water supplies.	1,270,000	Preliminary studies made. Additional study necessary to determine size of reservoir.
Morris County, Kans.: Dam and reservoir near Council Grove on Neosho River for stream flow stabilization and for improvement of municipal water supplies.	1,330,000	Preliminary studies made. Additional study needed to determine size of reservoir.
Lower Arkansas:		
Drainage:		
Faulkner County, Ark.; Haskell, Le Flore, McIntosh, Muskogee, and Pittsburg Counties, Okla.: Pope, Pulaski, and Saline Counties, Ark.; Tulsa and Wagoner Counties, Okla.: Malaria control.	1,665,000	
Flood control:		
Clarksville, Ark.: Flood protection levees on Spadra Creek	70,000	
Little Rock, Ark.: 2 miles of levees on Arkansas River for flood protection	111,000	Authorized by Congress. Detailed plans in preparation.
North Little Rock, Ark.: 4.3 miles of levees and walls on Arkansas River for flood protection	401,000	Do.
Pollution:		
Danville, Fort Smith, Hartford, Mansfield, Mulberry, and Waldron, Ark.: Sewer system and/or sewage treatment plants or intercepting sewer.	200,000	Preliminary plans made.
North Little Rock, Ark.: Intercepting sewers	269,000	Do.
Tulsa, Okla.: Sewage treatment plant	971,000	Do.
Water supply:		
Camp Pike, Dover, and Plumerville, Ark.; Stigler and Taft, Okla.: Water supply systems and/or extensions.	139,000	Preliminary or complete plans available.
Upper White-Black-St. Francis:		
Drainage:		
Bollinger, Butler, and Cape Girardeau Counties, Mo.; Independence and Lawrence Counties, Ark.; Perry County, Mo.; Randolph County, Ark.; Ripley and St. Genevieve Counties, Mo.; and White County, Ark.: Malaria control.	439,000	
Pollution:		
Berryville, Ark.; Cassville, Mo.; Green Forest and Hardy, Ark.; Ironton, Mo.; Pangburn, Ark.; Perryville, Piedmont, and Thayer, Mo.: Sewer systems and sewage-treatment plants.	441,000	Plans completed.
Doniphan, Mo.; Eureka Springs, Ark.; Poplar Bluff, West Plains, and Willow Springs, Mo.: Sewage treatment plants.	192,000	Preliminary plans made.
Huntsville, Leslie, Marshall, and Mountain View, Ark.: Sewer systems	176,000	Plans completed.
Recreation and wildlife:		
Ava, Mo.: Lake for recreational purposes	50,000	Plans not completed.
Water supply:		
Arkansas and Missouri: 200 small dams to augment adjacent rural water supply	1,000,000	
Doniphan, Mo.; Eureka Springs, Huntsville, Imboden, Jasper, Leslie, Mammoth Springs, Marshall, Melbourne, and Mountain Home, Ark.; Mountain View, Mo.; Pangburn, Ark.; Springfield, Mo., and Yellville, Ark.: Waterworks or improvements.	578,000	Plans completed.
Upper Red:		
Drainage:		
Wichita Falls, Tex.: Drainage of irrigated land	345,000	Preliminary plans made.
Pollution:		
Indian and public lands: Sealing of abandoned mine shafts and drill holes	10,000	
Pollution and water supply:		
Claude, Lefors, Petrolia, and Nacona, Tex.: Water supply and sewer systems	238,000	
Water supply:		
Indiahoma, Okla., Iowa Park, and Wheeler, Tex.: Water supply or improvements	162,000	
Wichita Falls, Tex.: Water supply, 5 miles of 42-inch pipe line and treatment plant	1,500,000	Do.
Washita:		
Pollution:		
Alex, Binger, Carnegie, Cement, Chickasha, Davis, Fort Cobb, Hammon, Leedey, Lindsay, Madill, Maysville, Mountain View, Rush Springs, and Verden, Okla.: Secondary sewage-treatment plants.	107,000	
Anadarko and Paul's Valley, Okla.: Complete sewage-treatment plants	65,000	
Byars, Okla.: Sewage-treatment plant	31,000	
Wayne, Okla.: Sanitary sewers	29,000	
Water supply:		
Anadarko, Byars, Chickasha, Cordell, and Marlow, Okla.: Water supply	174,000	
Lower Red:		
Drainage:		
Arkansas, Oklahoma, Louisiana, and Texas. Malaria control	1,000,000	
Flood Control:		
Bossier Parish, La.: Bayou Bodcau diversion floodway involving 33.5 miles of levee and 3 miles of ditches to carry waters of Bayou Bodcau and Cypress Bayou to Red River. For protection against headwaters floods.	1,893,000	Authorized by Congress. Detailed plans in preparation.
DeSoto, Natchitoches, and Red River Parishes, La.: Enlargement of drainage channels through Bayou Pierre and Bayou Pierre Lake from Bayou Wineey to the north at Grand Ecore for protection against headwaters floods.	300,000	Do.
Pollution:		
Antlers, Okla.; Asbdown, Ark.; Atoka, Caddo, and Conlgate, Okla.; Cove, DeQueen, Foreman, Fulton, Garland, Hope, and Horatio, Ark.; Hugo, Okla.; Lewisville, Lockesburg, McNeill, and Nashville, Ark.; Pittsburg, Okla.; Stamps, Ark.; Talihina, Okla.; Texarkana and Washington, Ark.: Sewer systems and sewage-treatment plants or improvements.	477,000	
Avery, Tex.; Barksdale Field, La., Blossom, Tex.; Dierks, Ark.; Gilmer, Tex.; Magnolia and Mineral Springs, Ark.; New Boston, Tex.; Shreveport, La.; Wascom, Tex. Sewer systems and sewer treatment plants or improvements.	357,000	Preliminary plans made.
Pollution and water supply.		
Atlanta, Daingerfield, Detroit, Omaha, Pecan Gap, Pittsburg, and Texarkana, Tex.: Water supply and sewage systems or improvements.	968,000	Plans made.
Water supply.		
Asbdown, Cove, DeQueen, Foreman, Fulton, Garland, Hope, Horatio, and McNeill, Ark.; Pittsburg, Okla.; stamps, Ark., Talihina, Okla., and Washington, Ark.: Water supply systems and water improvements.	234,000	

Southwest Mississippi Basins Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Lower Red—Continued.		
Water supply—Continued.		
Atoka, Okla.: Bailey, Bloomburg, Commerce, and Cooper, Tex.; Dierks, Ark.; Dodd City, Tex., Durant, Okla.; Ector and Hallsville, Tex.; Lewisville and Magnolia, Ark.; Mooringsport, La.; Mount Pleasant, Tex.; Ringgold and Robeline, La.; Sherman and Trenton, Tex.; Valliant, Okla.; and Waskom, Tex.: Water supplies.	$706,000	Preliminary plans made.
Ouachita:		
Drainage:		
Malaria control project throughout basin	100,000	10-year program.
Pollution.		
Amity, Ark.; Farmerville and Jonesboro, La.; Murfreesboro, Sparkman, and Stephens, Ark.: Sewer systems and sewage treatment plants.	234,000	Preliminary plans made.
Water supply:		
Amity and Benton, Ark.; Bernice and Chatham, La.; Delight, Ark.; Farmerville, La.; Fountain Hill and Hampton, Ark.; Hodge, Jena, and Jonesboro, La.; Okalona, Ark.; and Pollock, La.: Waterworks and water supply systems or improvements.	358,000	Do.
GROUP B—FOR DEFERRED CONSTRUCTION		
Upper Arkansas:		
Flood control and irrigation:		
Trinidad, Colo.: Construction of 5 reservoirs and intake canal for flood control and irrigation	$652,000	Plans nearing completion.
Cimarron Basin:		
Recreation and water supply:		
Construction of small reservoirs for flow correction, water supply, and recreation throughout the basin.	500,000	Exact locations and details to be determined by study project.
Water supply:		
Logan County, Okla.: Dam and reservoir at Crescent site for storage for increasing low flows	1,266,000	Subject to further study.
Canadian:		
Flood control:		
Canadian County, Okla.: Reservoir on North Canadian River for flood control and storage of water	6,032,000	Cost estimate is approximate. Report on selection of exact site in preparation by Corps of Engineers.
Irrigation:		
Cimarron, Harper, and Texas Counties, Okla.: Wells near Boise City, Guyman, and Laverne, Okla., for irrigation purposes.	50,000	
Clay and San Miguel Counties, N. Mex.: Canal and lateral system on Conchas Irrigation project, to irrigate 35,000 acres in vicinity of Tucumcari.	1,000,000	Reconnaissance surveys have been made. Cost given is for first 2 years. Additional needed to complete, $2,980,000.
Colfax County, N. Mex.: Improvements to Colfax irrigation district	75,000	Preliminary plans made.
Mora County, N. Mex.: Structures for the Watrous irrigation system to irrigate about 10,000 acres in Mora River Valley.	400,000	Do.
Irrigation and water supply:		
Woodward County, Okla.: Reservoir and water mains for irrigating nurseries and for fire protection at Bureau of Plant Industry Field Station.	50,000	Present water supply inadequate. Sketch plans have been completed.
Water supply:		
Borger and Dalhart, Tex.: Water supply	915,000	
Clayton, N. Mex.: Storage reservoir to augment urban water supply	150,000	Preliminary plans only.
Greenfield, Indianola, Morris, Okfuskee, and Wetumka, Okla.: Water-supply improvement	251,000	
Central Arkansas:		
Flood control:		
Augusta, Kans.; Blackwell and Kaw City, Okla.; Winfield, Kans.: Levees to protect property	319,000	Authorized by Congress. Plans in preparation.
Belle Plaine, Kans.: Levees from the mouth of Big Slough Floodway along Arkansas River to mouth of Ninnescah River and along the Ninnescah River for protection of agricultural lands.	1,882,000	Authorized by Congress.
Hutchinson, Kans.: Diversion of Cow Creek around Hutchinson for flood control	1,400,000	Do.
Wichita, Kans.: Big Slough Floodway, Chisholm Creek Improvement and Diversion, Little Arkansas and Arkansas Rivers Diversion for flood control.	4,200,000	Do.
Flood control and pollution:		
Chickaskia River, Cole Creek, Little Walnut and Ninnescah Rivers, Slate Creek and Whitewater River, Kans.: Construction of 6 reservoirs on the above streams.	14,000,000	
Pollution:		
Argonia, Arlington, Burden, Chase, Claflin, Clearwater, Conway Springs, Cunningham, Haviland, Holyrood, Leon, Little River, South Hutchinson, Turon, and Whitewater, Kans.: Sewage treatment plants.	455,000	
Recreation and wildlife:		
Cowley and Sedgwick Counties, Kans.: 2 small lakes on Otter and Clear Creeks for recreational development.	480,000	Preliminary plans made.
Water supply:		
Alden, Andale, Bluff City, Cambridge, Chase, Coats, Garden Plain, Latham, South Hutchinson, Sun City, Whitewater, and Wilmore, Kans.: Waterworks or waterworks improvements.	225,000	
Neosho-Verdigris:		
Flood control:		
Benedict, Kans.; Chautauqua County, Kans.; Cherokee, Elk City, and Fredonia, Kans.; Lyon and Montgomery Counties, Kans.; Washington County, Okla., and Wilson County, Kans.: Levee system to protect agricultural lands along Caney Creek and the Elk, Fall, Neosho, and Verdigris Rivers.	1,246,000	Authorized by Congress. Contingent upon study under A-1.
Cherokee County, Okla.: Dam and reservoir at Tenkillers Ferry on Illinois River for flood control	9,692,000	Study authorized by Congress.
Oklahoma and Kansas: Channel clearance on Verdigris River from its mouth to Madison, Kans., for flood relief.	232,000	Authorized by Congress.
Flood control and water power:		
Delaware County, Okla.: Dam and reservoir near Pensacola on Neosho River for partial control of floods on the Arkansas River, stream flow regulation and ultimate development of water power.	9,000,000	Study authorized by Congress. Oklahoma has created the Grand River Dam Authority to sponsor this project. Cost estimate is reduced from that of Corps of Engineers to provide for reduced scope.
Lower Arkansas:		
Flood control:		
Dardanelle, Faulkner County levee district no. 1, Gillett to North Little Rock, Morrilton, Ark.: Levees on Arkansas River.	1,763,000	Authorized by Congress. Detailed plans in preparation. Estimate includes $884,000 for part of the Little Rock-Gillett levee system, balance of which is in Lower Mississippi list.
Pollution:		
Altus, Atkins, and Belleville, Ark.; Bixby, Okla.; Booneville, Ark.; Boynton, Okla.; Clarksville, Coal Hill, and Conway, Ark.; Coweta, Okla.; Dardanelle, Dover, Dyer, and Hartman, Ark.; Heavener, Jenks, and Kiefer, Okla.; Lamar, Levy, Magazine and Morrilton, Ark.; Mounds and Muskogee, Okla.; Ola, Ozark, Paris, Plainview, and Plumerville, Ark.; Poteau, Okla.; Russellville, Ark.; Sand Springs, Sapulpa, Stigler, Spiro, and Sallisaw, Okla.; and Van Buren, Ark.: Sewer systems and/or sewage-treatment plants.	829,000	

Southwest Mississippi Basins Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Lower Arkansas—Continued.		
Recreation and wildlife:		
Big Piney, Cass, Cedar Creek, Gaylor, Hurricane Fork, Maumelle, Middle Fork, Rough Hollow, Shores Lake, and Trace Creek, Ark.: Dams to develop recreational reservoirs in Ozark and Ouachita National Forests.	$1,745,000	Cedar Creek Reservoir partly completed.
Water supply:		
Altus, Atkins, Belleville, Clarksville, Coal Hill, Conway, Dardanelle, Dyer, and Hartman, Ark.; Heavener and Keifer, Okla.; Lamar, Magazine, and Morrilton, Ark.; Mounds, Okla.; Paris and Plainview, Ark.; Poteau, Okla.; Russellville, Ark.; Sand Springs, Sapulpa, and Sallisaw, Okla., and Van Buren, Ark.: Water-supply systems and/or improvements.	683,000	
Upper White-Black-St. Francis:		
Flood control and water power:		
Baxter and Marion Counties, Ark.: Wild Cat Shoals Dam and Reservoir on White River near Cotter	25,712,000	Preliminary plans made.
Taney County, Mo.: Table Rock Dam and Reservoir on White River near Branson	15,206,000	Do.
Irrigation:		
Cleburne County, Ark.: Greers Ferry Dam on Little Red River near Heber Springs to impound water for irrigation of rice in Grand Prairie region.	2,050,000	Do.
Pollution:		
Ava and Branson, Mo.; Calico Rock and Cotter, Ark.; and Crane, Mo.: Sewage system and sewage-treatment plants.	184,000	Do.
Farmington, Fredericktown, and Jackson, Mo.: Sewage-treatment plants	87,000	Do.
Water power:		
Carter County, Mo.: Mill Creek Dam on Current River near Van Buren	5,075,000	Do.
Ripley County, Mo.: Hargus Eddy Dam and Reservoir on Current River near Doniphan	7,141,000	Do.
Shannon County, Mo.: Blair Creek Dam on Current River below Eminence	6,726,000	Do.
Water supply:		
Fayetteville, Harrison, and Salem Ark.: Water supply and/or waterworks systems or improvements.	205,000	Do.
Upper Red:		
Drainage:		
Grayson and Hall Counties, Tex.: Malaria control	117,000	
Flood control:		
Farmer County, Tex.: Dam on Friona Draw for flood control and flow regulation for benefit of town of Friona and Palodura Canyon Park.	40,000	
Pollution:		
Altus, Apache, Comanche, Davidson, Devol, Eldorado, Fletcher, and Grandfield, Okla.; Hedley, Tex.; Hollis, Mangum, Marietta, Ringling, Ryan, Sayre, Temple, Tipton, Walters, and Waurika, Okla.: Construction of sewage-treatment plants or improvements to existing plants.	243,000	
Clarendon, Dimmitt, Happy, Henrietta, St. Joseph, Shamrock, and Vernon, Tex.: Sewage-treatment plants.	204,000	Additional treatment needed.
Water power:		
Baylor County, Tex.: Lake Kemp power plant. Installation of 1,400 kilowatt generating capacity to make use of water now wasted.	170,000	Project dependent on agreement of water users not to expand acreage under irrigation and on analysis of flow during recent dry years.
Water supply:		
Archer City, Childress, Crowell, Electra, Henrietta, and Holliday, Tex.: Water treatment plants	200,000	All towns have surface supplies which are unsatisfactorily treated.
Canyon, Harrold, Matador, and Pottsboro, Tex.: Water supply systems or improvements	216,000	
Washita Basin:		
Flood control, irrigation, and water supply:		
Oklahoma: 25 reservoirs for flood control, irrigation, flow equalization, and water supply	1,500,000	Subject to confirmation or modification after completion of study project. Cost given is for first 2 years. Additional needed to complete, $9,268,000.
Irrigation:		
Caddo, Canadian, Comanche, and Washita Counties, Okla.: Small irrigation projects for Arapaho, Cheyenne, and Kiowa Indian Reservations. Water supply from wells and Washita River.	57,000	
Washita River Basin, Okla.: Irrigation of 300,000 acres of bottom land	7,500,000	Do.
Pollution:		
Cheyenne, Okla.: Sewer system and sewage treatment plant	100,000	
Lower Red:		
Flood control:		
Caddo Parish, La.: Black Bayou Dam and Reservoir	125,000	Authorized by Congress.
Caddo Parish, La.: Wallace Lake Dam for storage of floodwaters	400,000	Do.
Pollution:		
Cumby, De Kalb, Denison, Honey Grove, Hughes Springs, Linden, Mount Vernon, and Sulphur Springs, Tex.: Sewage treatment plants.	198,000	
Recreation and wildlife:		
Bienville Parish, La.: Construction of earth filled dam across Bayou Dorcheat, for restoration of Lake Bistenau for fish and game preserve.	71,000	
Water supply:		
Antlers, Broken Bow, and Isabel, Okla.; Sulphur Springs, Tex.: Water supply improvements	95,000	
Arkansas, Oklahoma, and Texas: Small water conservation projects in 14 counties in these States	500,000	Locations and plans dependent on study project in group A-1.
Ouachita:		
Drainage:		
Bradley, Dallas, Drew, Hot Springs, Jefferson, and Union Counties, Ark.: Malaria control	96,000	On authorized program of W. P. A.
Flood control:		
Hot Springs, Ark.: Improvement of storm water sewers for flood control	250,000	
Flood control and water power:		
Hot Springs, Ark.: Dam at Blakely Mountain for power, flood control, and improvement of downstream water supplies.	13,412,000	Preliminary plans only.
Pollution:		
Arkadelphia, Benton, Camden, Crossett, El Dorado, Huttig, Louann, Malvern, Mena, Monticello, Norphlet, Prescott, Sheridan, and Warren, Ark.: Sewage treatment plants and/or improvement and extension of sewer systems.	382,000	
Delight, Fountain Hill, Graysonia, Hampton, Hermitage, Mount Ida, Okolona, Rosboro, Strong, Thornton, and Wilmar, Ark.: Sewer systems.	228,000	
Recreation and wildlife:		
Corn Lake and Dugdemona Bayou, La.; Hot Springs, Ark.; Iatt Lake, La.; and Mena, Ark.: Park development and improvement of streams and lakes for recreational purposes.	479,000	
Water power:		
Malvern, Ark.: Increase of installed capacity of generating plant at Remmel Dam to utilize drawdown from Blakely Mountain Reservoir.	760,000	Do.
Water supply:		
Graysonia, Hermitage, and Wilmar, Ark.: Water supply systems	62,000	
Huttig, Louann, Malvern, Mena, Monticello, Norphlet, and Prescott, Ark.: Improvement to water supply systems.	104,000	

LOWER MISSISSIPPI

Water problems in the lower Mississippi Valley relate chiefly to protection against surplus waters and to their disposal, rather than to the conservation of water for man's use. Nevertheless, storage of water is now receiving consideration in certain areas partly because of recent droughts, and further expansion of the rice-growing industry is contingent upon the development of additional supplies. There are no water power sites of commercial value in the area. Navigation has increased of late, but it raises no technical problems beyond those of channel improvement and stabilization.

The lower Mississippi district may be divided into three distinct parts: (1) the narrow section of the valley from St. Louis to Cairo, (2) the wide alluvial valley below Cairo, and (3) the uplands east of the Mississippi River which stretch from the Ohio River to the Gulf coast.

1. The narrow valley between St. Louis and Cairo afforded no suitable lowland sites for towns and little land for cultivation. It accordingly always has had a small population and has presented no flood problem of magnitude. The river channel is here in good navigable condition, but its further improvement and stabilization probably are warranted by recent trends in traffic and particularly by the functional relation of this section of the river to the whole system of inland waterways now under unified development.

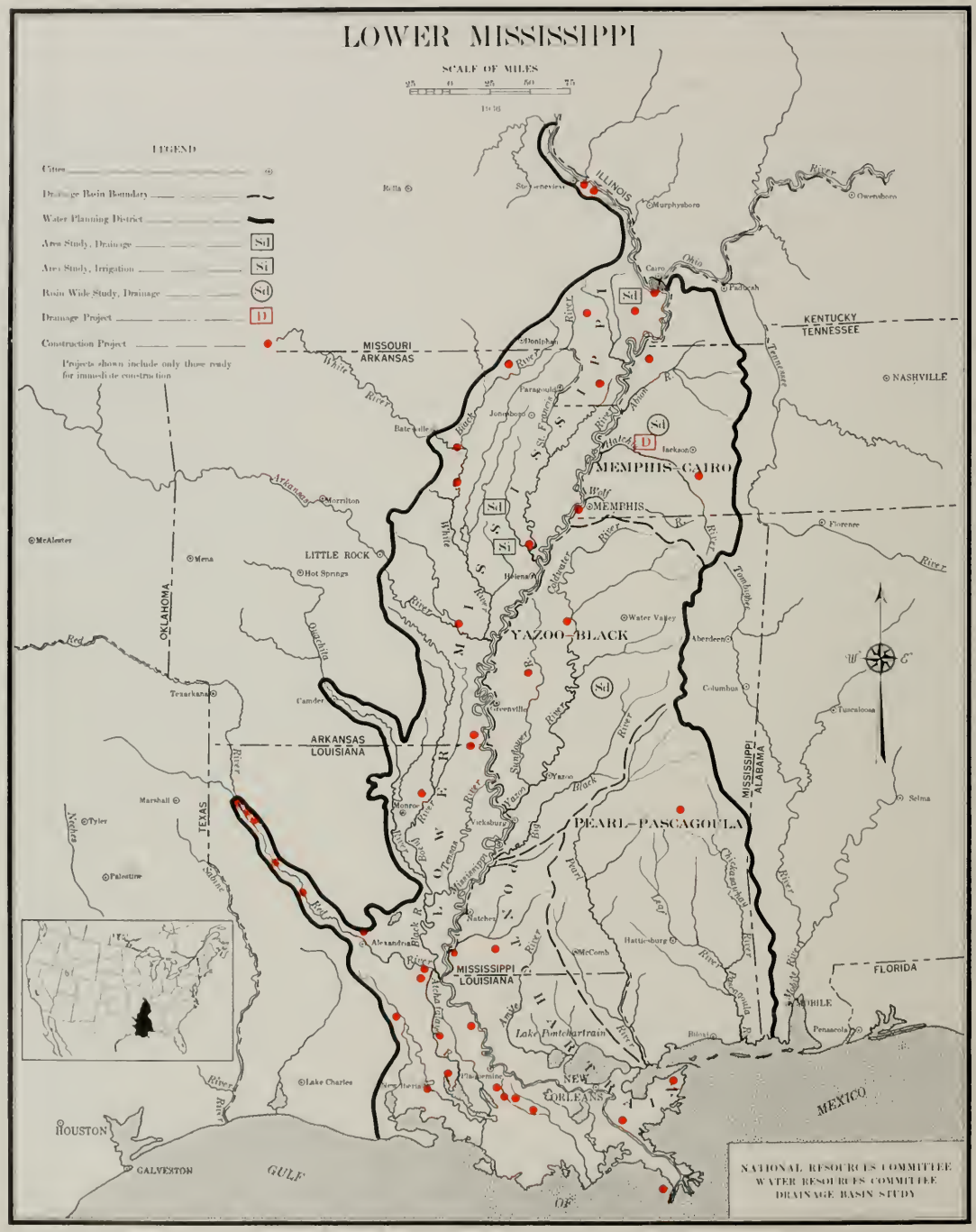
2. Below Cairo, the flood problem is of paramount importance. There the Mississippi channel and flood plain, as developed by natural processes, formed a huge trough by which storm waters from the Ohio River, the upper Mississippi, the Missouri, and numerous southern tributaries, both large and small, were conveyed to the Gulf of Mexico. In order to occupy and utilize parts of the rich flood plain, the construction of levees was begun early in the eighteenth century and has continued to the present. Until 1917 it was carried on by many diverse interests. In 1883, a tentative grade line was established for the top of the levees all the way from Cairo to the mouth of the river. In 1898, a new grade line, averaging some 5 feet higher, was established. After the floods of 1912 and 1913 demonstrated its inadequacy with tragic force, a third line was adopted in 1914 several feet higher than the 1898 grade. In 1927 the levees, which had been brought almost everywhere to the standard 1914 grade line, were again broken in many places and the greater part of the valley was flooded with appalling loss of life and property. In 1928 the Congress adopted a new plan of protection involving still higher levees supplemented by a system of emergency floodways. Additional works provided in the act approved June 15, 1936, are designed to afford protection against floods from lower tributaries and, by means of a floodway system of more generous capacity, to care for floodwaters in excess of the safe carrying capacity of the leveed course of the main river. Security appears now to be reasonably assured. Reservoir systems on the Tennessee, Ohio, and other tributaries of the Mississippi will add to the security otherwise in prospect by increasing the freeboard on the levee system along the lower Mississippi and by reducing the frequency and duration of floodway use.

Marked improvement of land-drainage conditions, involving the redesign and reconstruction of hundreds of independent drainage works and their integration into a few well planned, unified systems is a need of prime importance from the standpoints of agriculture and the elimination of malarial conditions. The magnitude of the task involved has made local endeavor ineffectual in most sections. Cooperation is necessary between adjoining districts and between States.

There are large areas normally subject to backwater from the Mississippi at high stages which cannot be made safe and suitable for human occupancy through flood protection, drainage, and associated measures. Most of these lands are forested and they function effectively during floods as huge natural retarding basins. This represents their best use for the greater good of the greater number. They might well be incorporated in national forests to insure perpetuity of the important service they render, to form wildlife refuges, and to obviate further ill-advised attempts at their reclamation and agricultural occupation. It may be added that flood control and drainage for any other partially developed or undeveloped portions of the alluvial valley should be associated with a program of land development, occupation, use, and ownership that will insure a notably higher standard of living than now prevails there. The mode of life now dominant in the lower valley, characterized particularly by a pernicious tenant system, should not be extended.

Irrigation by pumping from deep wells in the rice fields of eastern Arkansas has depleted underground waters to an alarming extent. The remedy apparently lies in storing flood waters in local reservoirs, but a careful study of the situation in both its technical and economic aspects is needed.

3. The associated water and land problems of the uplands east of the Mississippi River relate especially


LOWER MISSISSIPPI
SCALE OF MILES
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Area Study, Drainage
Area Study, Irrigation
Basin Wide Study, Drainage
Drainage Project
Construction Project
Projects shown include only those ready for immediate construction
MISSOURI
ARKANSAS
KENTUCKY
TENNESSEE
MEMPHIS-CAIRO
YAZOO-BLACK
PEARL-PASCAGOULA
LITTLE ROCK
MEMPHIS
OKLAHOMA
ARKANSAS
LOUISIANA
MISSISSIPPI
ALABAMA
TEXAS
MISSISSIPPI
LOUISIANA
NEW ORLEANS
FLORIDA
MOBILE
HOUSTON
GALVESTON
GULF OF MEXICO
NASHVILLE
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

to poor drainage in the tributary valleys, malarial conditions of grave proportions, an advanced state of soil erosion, and progressive retirement of farm lands from cultivation. These interlocking problems exist with little variation from end to end of the upland belt. Vigorous and comprehensive measures are essential, and Federal assistance is needed in planning them in detail to the advantage of all concerned.

Systematic general studies of underground water supplies are needed in both the lowlands and uplands of the district. Wasteful use is bringing the available supplies of certain localities close to exhaustion.

Lower Mississippi Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
Cairo-Memphis: **1. Investigation Projects**		
Drainage:		
Study to devise a coordinated plan of upland drainage. Plan provides for malaria control	$100,000	Surveys, investigation and report, in line with similar recommendations by the Planning Commissions of Kentucky and Tennessee, but more comprehensive.
Lower Mississippi:		
Drainage:		
Study to devise a coordinated plan of drainage for alluvial valley counties in Arkansas	100,000	To be coordinated with a similar study in Missouri.
Study to devise a coordinated plan of drainage for 9 alluvial valley counties in Missouri	50,000	To be coordinated with a similar study in Arkansas.
Irrigation:		
Study project for water supply for irrigation of rice fields in alluvial valley counties in Arkansas	75,000	Extension of previous studies.
Yazoo-Black:		
Study to devise a coordinated plan of drainage for the entire lowlands area known as the Yazoo Delta, and to improve agricultural conditions and plantation methods.	150,000	
Cairo-Memphis: **2. Construction Projects**		
Drainage:		
Memphis, Tenn.: 9 drainage projects including street drainage	1,704,000	
Memphis, Tenn.: 9 drainage projects involving levee construction, stream improvement, and drainage ditches for flood protection and malaria control.	414,000	
Recreation and wildlife:		
Chester and McNairy Counties, Tenn.: Creation of lakes for county fish and game preserves	14,000	Plans completed.
Lake and Obion Counties, Tenn.: Water control structures to create water-fowl refuge at Lake Isom	103,000	Plans completed. 45 percent of purchase area optioned.
Lower Mississippi:		
Drainage and flood control:		
Sikeston, Mo.: Construction of concrete storm sewer and riprapping river bank	31,000	Final plans completed.
Flood control:		
Continuation of flood-control project for lower Mississippi River as modified in act of June 15, 1936. The project comprises the following work:	100,000,000	Cost given is for next 2 years. $210,000,000 additional needed to complete. Authorized by Congress.
1. Avoyelles, Iberia, Iberville, Pointe Coupee, St. Martin, and St. Mary Parishes, La.: Atchafalaya Basin floodways to relieve Mississippi River floodwaters in excess of its safe carrying capacity. Includes guide levees, control works for Morganza floodway, land rights, drainage, clearing, railroad and highway changes.		
2. Atchafalaya River improvements in Louisiana. For flood control and navigation. Includes new outlet from Grand Lake into Gulf of Mexico.		
3. Chicot and Desha Counties, Ark.; East and West Carroll, Madison, and Tensas Parishes, La.: Eudora floodway and control works. To relieve the Mississippi River of floodwaters in excess of its safe discharge capacity. Includes guide levees, drainage, clearing, railroad and highway changes, land rights and utility changes.		
4. St. Francis River flood-control works in Arkansas: To protect against headwater floods above the backwater of the Mississippi River, involves construction of levees and drainage structures.		
5. Desha and Phillips Counties, Ark.: White River Emergency Reservoir. Levee construction to protect 152,400 acres against all but very great floods. During latter, area is available for flood storage for protection of lower Mississippi Valley.		
6. Arkabutla, Coffeeville, Coldwater, Enid, Grenada, and Holcomb Counties, Miss.: Flood-control reservoirs for protection of Yazoo Delta lands against headwater floods.		
7. Dredging, channel contraction and revetment on main river.		
Field examination, appraisal, and acquisition by the United States of lands in the Eudora and Morganza floodways in order to withdraw them from human occupancy, and to convert them into national forest and game preserves. These are permanently exposed to occasional flood overflows.	[1] 7,000,000	Cost estimate roughly approximate. Acquisition to be considered under provisions of the Weeks Act by establishment of land-purchase units.
Avoyelles Parish, La.: Bayou des Glaises Diversion Canal. Excavation of a drainage canal 6 miles long from Bayou des Glaises at Moreauville to a borrow pit of West Atchafalaya levee at Lake Bayou. To reduce overflow and improve drainage.	285,000	Authorized by Congress. Detailed plans in preparation.
Columbia, La.: Construction of levees on Ouachita River, including bulkhead and interior drainage works to protect town from flooding by Ouachita and Mississippi Rivers.	395,000	Do.
Grant and Rapides Parishes, La.: Extension of existing levees along left bank of Red River from Colfax, La., to north bank of Bayou Darro. To protect lands along left bank of Red River from overflow.	71,000	Preliminary plans completed.
Jackson and Woodruff Counties, Ark.: Village Creek, White River, and Mayberry district. Construction of 197 miles of levees along east bank of White River. For flood protection.	1,154,000	Authorized by Congress.
Jefferson, Lincoln, and Pulaski Counties, Ark.: North Little Rock to Gillette, improvement of existing levees and construction of new levees on north bank of Arkansas River for flood protection.	1,845,000	Authorized by Congress. Remainder of project, $884,000, is included in southwest Mississippi list.
Natchitoches Parish, La.: Construction of 21 miles of levee on right bank of Red River from head of Cave River to and across mouth of Cave River; includes low dam, flood gates, and drainage structures. For protection against headwater floods.	355,000	Authorized by Congress. Detailed plans in preparation.
Newport on White River, Ark., in Jackson County. Improvement on 6.2 miles of existing levees and construction of flood wall. For flood protection.	261,000	Authorized by Congress.
Perry County drainage and levee districts, nos. 1, 2, and 3, Missouri. Improvement of existing Mississippi River front and back levees.	913,000	Do.
Red River Parish, La.: Enlargement and extension of existing levee system on right bank of Red River below Shreveport. For protection against headwater floods.	180,000	Authorized by Congress. Detailed plans in preparation.
Skaggs Ferry on Black River east of Pocahontas, Ark., in Randolph County. Construction of 8.2 miles of levee including drainage works for flood protection.	80,000	Authorized by Congress.
Navigation:		
Assumption and La Fourche Parishes (Bayou La Fourche) near Napoleonville, La.: Dredging channel 6 feet deep and 60 feet wide for improvement of navigation.	351,000	Cost figure needed to complete. Surveys and preliminary plans completed.
Mississippi River between the Ohio and Missouri Rivers: Consists of dredging and channel contraction work to provide navigable channel 9 feet deep, 300 feet wide, for a length of 195 miles—part of Lakes to the Gulf Waterway.	2,000,000	Cost given is for first 2 years. Additional needed to complete, $10,100,000. Surveys completed.
Southwest Pass, Mississippi River: Construction of dikes and regulating works to maintain a more stable channel and improve navigation conditions.	300,000	Cost given is for first 2 years. Additional needed to complete, $420,000. Surveys completed.

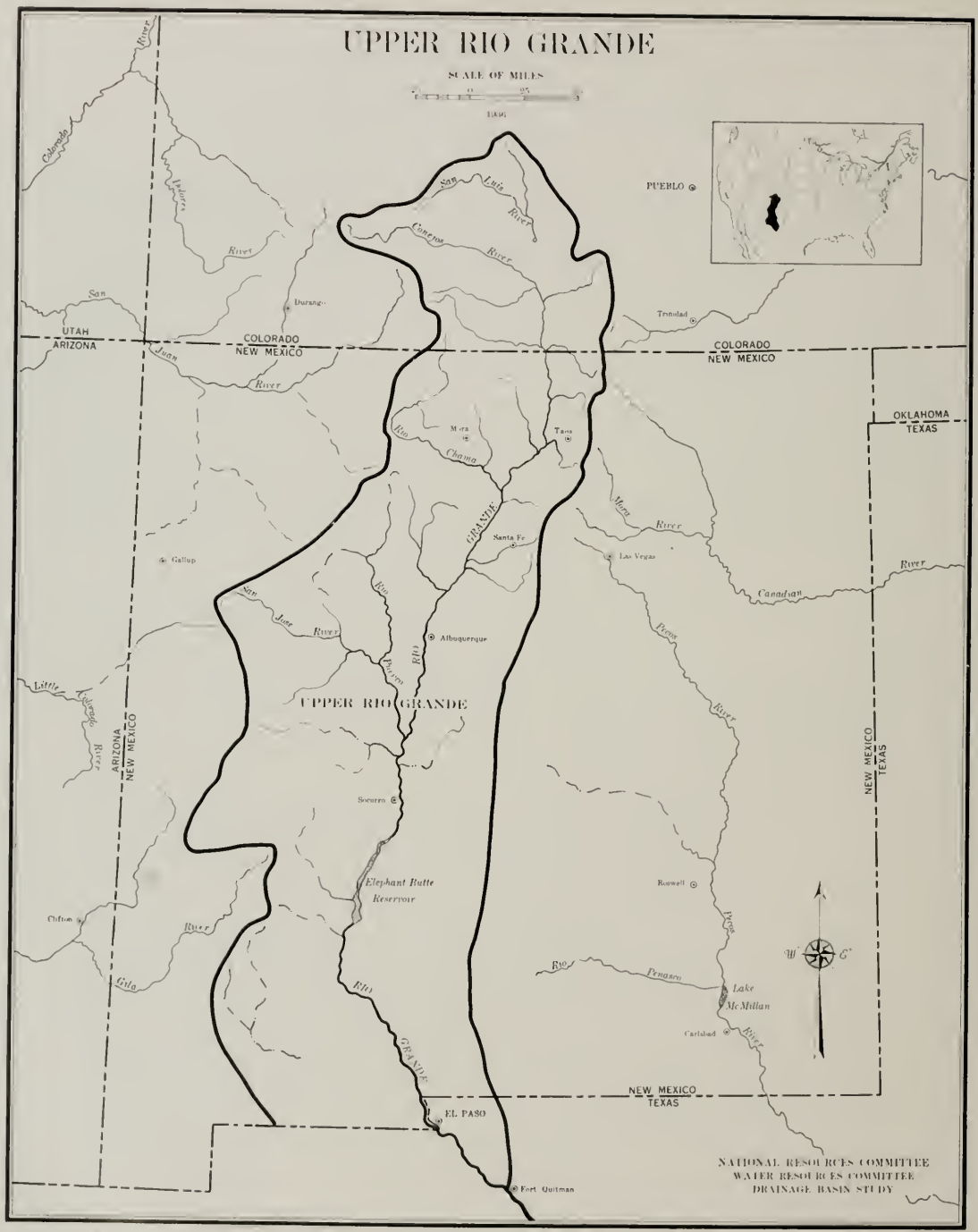
[1] Approximately.

Lower Mississippi Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Lower Mississippi—Continued.		
Pollution and Water Supply		
Monroe, La.: Sewer system; extension of water supply system; storm sewers and pumping plant; drainage canal and pumping plant.	$1,068,000	Preliminary plans made.
Pineville, La.: Sewers	50,000	
Recreation and wildlife:		
Avery Island Game Reserve, Iberia Parish, La.: General improvements urgently needed	21,000	Plans completed.
Mingo Migratory Waterfowl Refuge in Stoddard County, Mo.: Several miles of dikes to restore swamp status, including structures for water-level control.	82,000	Preliminary plans made. Lands optioned and under condemnation.
Water supply:		
Napoleonville, Assumption Parish, La.: 33 wells, average depth 200 feet to obtain uncontaminated drinking water for communities throughout parish.	12,000	Plans completed.
Harrisonburg, La.: Water supply system	22,000	
Port Allen, La.: Extension of waterworks system and deep well	21,000	Detailed plans and specifications available.
Steele, Mo.: 2 settling basins and water-treatment plant; also necessary appurtenances to existing water system.	22,000	Final plans completed.
Sunset, La.: New waterworks, including deep well	28,000	Detailed plans and specifications available.
Thibodaux, La.: Desilting basin and treatment plant for water supply from Mississippi River	29,000	Plans completed.
Yazoo-Black:		
Pollution:		
Cleveland, Miss.: Sewer system and sewage treatment plant	227,000	Final plans and specifications are in progress.
Pontchartrain:		
Flood control:		
Adams and Wilkinson Counties, Miss.: Headwater dams and channel improvements on Homochitto River.	50,000	Detail plans in preparation Authorized by Congress.
Wilkinson County, Miss.: Channel improvements on Buffalo River	35,000	Plans completed. Authorized by Congress.
Recreation and wildlife:		
Plaquemines County, La.: Delta migratory waterfowl refuge—Opening canals, repairing dikes, and restoring existing structures.	125,000	Plans completed. Lands acquired by the Biological Survey.
Water supply:		
St. Bernard, La.: Water supply for livestock and other purposes, and mosquito control, involving clearing channel of Bayou Terre Aux Boeufs and building bulkheads.	41,000	Plans completed.
Pearl Pascagoula:		
Water supply:		
Hickory, Miss.: Complete waterworks, including deep well	27,000	Plans 75 percent completed.
GROUP B—FOR DEFERRED CONSTRUCTION		
Lower Mississippi, general:		
Flood control:		
Field examination, appraisal, and acquisition by the United States of lands which cannot be economically protected from overflow, with the view to converting them into national forest and game preserves and for use as natural flood storage area. This would include selected areas between the Mississippi River and its bluffs.	$19,300,000	Cost estimate roughly approximate. Acquisition to be considered under provision of the Weeks Act by establishment of land-purchase units.
Cairo-Memphis:		
Flood control:		
Dyer, Lake, and Obion Counties, Tenn.: Levee from Tiptonville to mouth of Obion River to protect lowlands east of Mississippi River, including towns of Tiptonville, Ridgley, and other smaller communities.	730,000	Authorized by Congress. Construction contingent upon procurement of land, settlement of damages and maintenance of structures, by local authorities. Negotiations not completed. Detailed plans not completed.
Navigation:		
Memphis, Tenn.: Completion of dredging 9-foot navigable channel in Wolf River for Memphis harbor to Hindman Ferry Road.	628,000	Authorized by Congress. Construction contingent upon local authorities furnishing right-of-way Survey completed.
Pollution:		
Collierville, Tenn.: Sewer system with partial sewage treatment plant	71,000	Preliminary plans completed.
Huntingdon, Tenn.: Sewer system	45,000	Do
Pollution and water supply:		
Dyersburg, Tenn.: Additional water supply treatment plant and extension of mains; extensions of sewer system and partial sewage treatment plant.	127,000	Plans completed
Newbern, Tenn.: Extension of water supply and sewer systems	115,000	Do.
Union City, Tenn.: Extension of water supply and sewer systems and construction of partial sewage treatment plant.	75,000	Do.
Water supply:		
South Fulton, Tenn.: Extension of water supply system	80,000	Preliminary plans completed.
Lower Mississippi.		
Flood control:		
Big Bottom, Independence County, Ark.: Construction of 9.8 miles of levee along north bank of White River at mouth of Black River.	148,000	Authorized by Congress.
Butler County, Mo., and Clay County, Ark.: Construction of a leveed floodway to divert flood waters of Black River by building 88 miles of levees.	2,604,000	Do.
Butler and Ripley Counties, Mo., and Clay County, Ark.: Construction of 22.5 miles of levee along Little Black River	820,000	Do.
Lee County, Ark.: Construction of 3.3 miles of levee on Big Creek and L'Anguille River	97,000	Authorized by Congress. Preliminary plans complete. Requires further study
Monroe, Prairie, and Woodruff Counties, Ark.: Construct 74 miles of levees on east bank of White River and west bank of Cache River between Augusta and Clarendon, Ark.	8,100,000	
Navigation:		
Bayou Grand Caillou and Le Carpe in Terrebonne Parish, near Houma, La.: Dredging channel 5 feet deep and 40 feet wide a distance of 16.3 miles as feeder to intracoastal waterway, for improvement of navigation. Local interests to furnish right of way.	50,000	Sum needed to complete. Survey and preliminary plans completed.
Bayou Grossetete in Iberville Parish at Maringouin, La. Widening to full width of 60 feet to a depth of 5 feet to improve navigation.	101,000	Do.
Bayou Teche in Iberia Parish at New Iberia, La.: Widening channel to full project dimensions of 60 feet and 80 feet for a depth of 8 feet to improve navigation.	141,000	Do.
Pollution:		
Cape Girardeau and St. Genevieve, Mo.: Sewage treatment plants	120,000	Preliminary plans completed.
Recreation and wildlife:		
Ashley, Crittenden, Cross, Lonoke, Monroe, and Woodruff Counties, Ark.: Stream improvements and construction of reservoirs in 8 existing and proposed game refuges Improvements to fish and game preserves.	145,000	
Water supply:		
St. Genevieve, Mo.: Water treatment plant	27,000	

Lower Mississippi Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Yazoo Black:		
Pollution and water supply:		
Louise, Miss.: Waterworks and sewer system	$18,000	Final plans are in preparation.
Water supply:		
Blue Mountain, Isola, Maben, Mathiston, Pickens, and Raymond, Miss.: Waterworks systems or improvements.	133,000	Final plans and specifications are in progress for all except Raymond, on which preliminary plans only are prepared.
Pontchartrain:		
Pollution and water supply:		
Baton Rouge, La.: Additional water-supply and sanitary sewers to supplement existing facilities	110,000	Preliminary plans completed.
Recreation and wildlife:		
Brushy, Clear Springs, Molls, and Pretty Creeks in Homochitto National Forest, Miss.: Creation of small lakes for recreational purposes.	83,000	No plans prepared; lands being acquired.
Water supply:		
Gonzales, Independence, and Jackson, La.; Liberty, Miss.; Lutcher and Slaughter, La.: New waterworks or extensions.	195,000	
Pearl-Pascagoula:		
Drainage:		
Leake County, Miss.: Drainage ditch 4½ miles long, for malaria control	65,000	Preliminary plans completed.
Weir, Miss.: Drainage canal for Yockanookany drainage district	29,000	Do.
Drainage and pollution:		
Jackson, Miss.: Storm sewers to correct drainage	30,000	Do.
Meridian, Miss.: Drain swamps and ponds and build sanitary sewers	67,000	Do.
Pollution:		
Picayune, Miss.: Sanitary sewer system, 15 miles of main sewers	112,000	Do.
Poplarville, Miss.: Sanitary sewer system	37,000	Do.
Raleigh, Miss.: Sanitary sewer system	38,000	Do.
Recreation and wildlife:		
Beaver Dam Creek, Miss.: 72 acre-lake for recreational purposes and mosquito control	27,000	Do.
Seminary, Miss.: 480-acre fish hatchery	146,000	Do.
Winston County, Miss.: 30-acre lake for migratory water fowl refuge	37,000	Do.
Water supply:		
Ellisville, Miss.: Extension of existing waterworks	8,000	Plans 25 percent completed.
Forest, Miss.: Extension of existing water supply; includes deep well	8,000	Do.
Gulfport, Miss.: Artesian well to supplement existing water supply	15,000	Detailed plans and specifications in preparation.
Taylorville, Miss.: Waterworks, including deep well	40,000	Plans 20 percent completed.


UPPER RIO GRANDE
SCALE OF MILES
1936
PUEBLO
Trinidad
Durango
San Luis River
Conejos River
San Juan River
Colorado River
Animas River
UTAH
ARIZONA
COLORADO
NEW MEXICO
COLORADO
NEW MEXICO
OKLAHOMA
TEXAS
Mora
Taos
Rio Chama
RIO GRANDE
Santa Fe
Las Vegas
Mora River
Canadian River
Gallup
San Juan River
Albuquerque
Rio Puerco
Pecos River
Little Colorado River
ARIZONA
NEW MEXICO
UPPER RIO GRANDE
Socorro
NEW MEXICO
TEXAS
Elephant Butte Reservoir
Roswell
Clifton
Gila River
Rio Penasco
Lake McMillan
Carlsbad
RIO GRANDE
NEW MEXICO
TEXAS
EL PASO
Fort Quitman
W
G
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

UPPER RIO GRANDE

(Above Fort Quitman, Tex.)

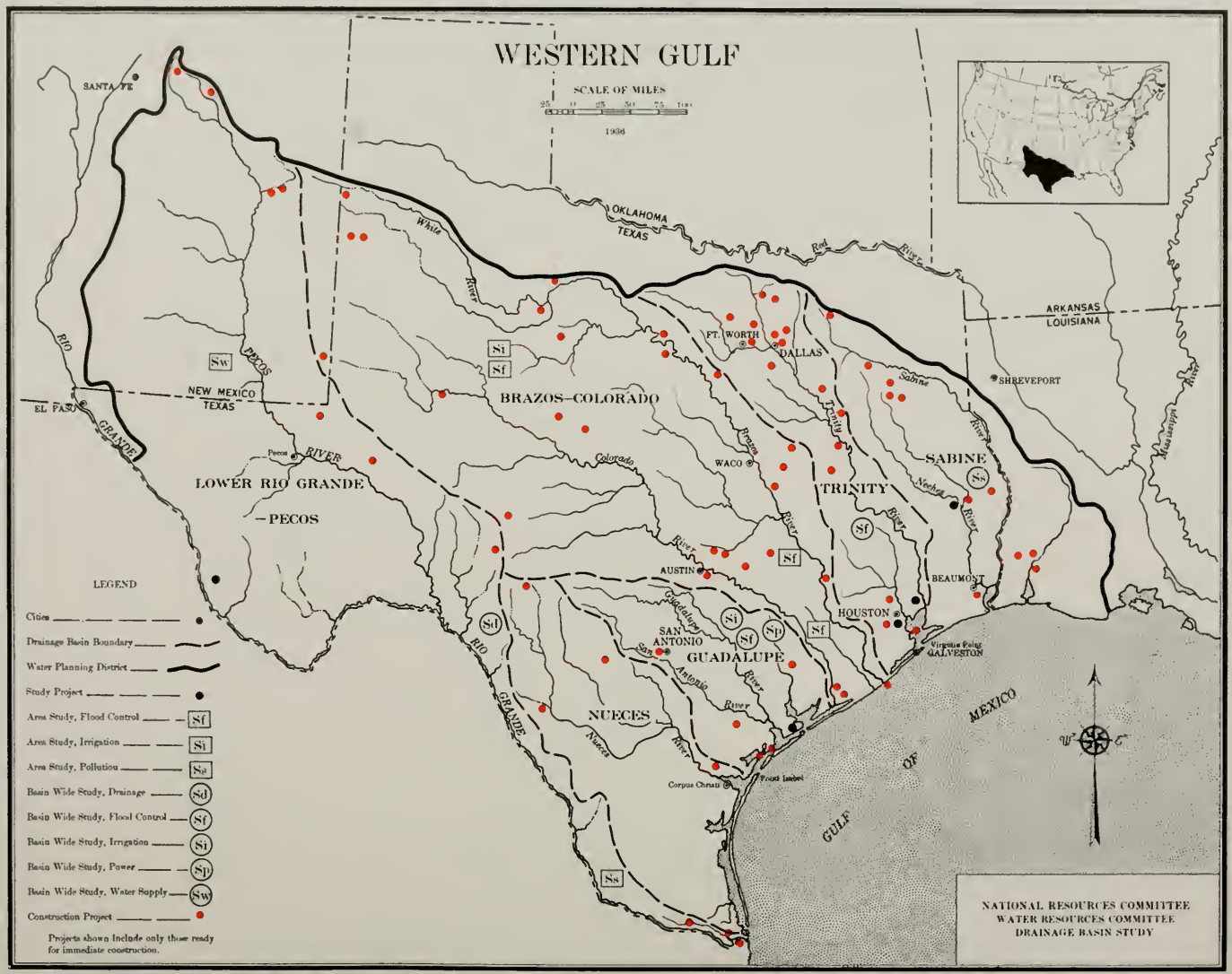
Life in the Upper Rio Grande Valley depends on water, and the outlook for the valley through many years depends fundamentally on decisions likely to be reached in the immediate future with respect to its water problems. At present the question of where the water shall be used is more urgent than the question of how it shall be used. No construction projects are recommended for the valley in the present report, pending early completion of the Rio Grande Joint Investigation. The background and nature of this investigation may be outlined briefly, since it constitutes a promising approach to one of the more serious types of problems in western development.

A long-standing controversy over the waters of the upper river between the States of Colorado, New Mexico, and Texas and their respective water claimants reached a critical stage in 1935. A special board of review appointed by the National Resources Committee at the suggestion of the Bureau of Reclamation found (1) that a situation existed in the area which was inimical to public and private interests, (2) that the available water resources were apparently fully appropriated, and (3) that Federal funds were being sought for new projects which might not only create conflicts of Federal investments utilizing waters of the river, but also violate the Rio Grande Compact, which provides in essence that further depletions of the waters of the river shall not be made before June 1, 1937. Shortly thereafter, the President issued an Executive order instructing the appropriate Federal officials not to approve any application for a project involving the use of Rio Grande waters without securing from the National Resources Committee a prompt opinion on it from all relevant points of view.

Early in December the Rio Grande Compact Commission adopted a resolution requesting the National Resources Committee, through its Water Resources Committee, to arrange immediately for a cooperative fact-finding investigation of the water resources of the Rio Grande Basin above Fort Quitman; of the past, present, and prospective uses and consumption of water in that basin in the United States; and of the opportunities for conserving and augmenting such water resources by all feasible means. It was recognized that the facts with regard to these matters are indispensable prerequisites to the successful negotiation of a permanent compact for the equitable apportionment of the waters of the upper basin among the several States involved, and that these facts should be established by an impartial organization. The National Resources Committee accepted the responsibility of guiding the investigation, the requisite funds were provided through Federal and State contributions, and complete plans were promptly agreed upon by the Federal and State agencies concerned with the investigation. All field work must be completed in the 1936 season and the findings of the investigation are to be available early in the spring of 1937.

Most of the work has been assigned to three Federal bureaus. The United States Geological Survey is investigating stream flow at all essential points on the main river and its tributaries, all diversions and return flows of water, underground waters, and the chemical quality of water. The Bureau of Agricultural Engineering is dealing with the problems of consumptive use, vegetative cover on all irrigated lands and water-consuming areas, and the water requirements of irrigable lands. The Bureau of Reclamation is carrying on surveys concerning the possibilities of storage and of importation of water by transmountain diversions. In addition, the Soil Conservation Service, the Resettlement Administration, the Bureau of Indian Affairs, and various other Federal, State, and local agencies are giving assistance in services, materials, records, office and laboratory space, and the like.

The Rio Grande Joint Investigation is blazing a trail that should lead to collective security in the form of a permanent compact under which the rights and equities of the several States and their citizens in the life-giving water of the valley will be firmly established through voluntary cooperation. It is seeking to substitute fact for opinion, cooperation for controversy. It will establish a sound basis for a water plan involving meritorious construction projects and a program for carrying them out in an orderly, balanced manner. It may well serve as an example of great importance in western life.


WESTERN GULF
SCALE OF MILES
1936
SANTA FE
OKLAHOMA
TEXAS
White River
Red River
ARKANSAS
LOUISIANA
RIO GRANDE
PECOS
NEW MEXICO
TEXAS
EL PASO
Sw
Si
Sf
BRAZOS-COLORADO
FT. WORTH
DALLAS
SHREVEPORT
Sabine River
Trinity River
Neches River
Mississippi River
Pecos RIVER
LOWER RIO GRANDE
PECOS
Colorado River
WACO
TRINITY
SABINE
Ss
AUSTIN
BEAUMONT
HOUSTON
Virginia Point
GALVESTON
Guadalupe River
SAN ANTONIO
GUADALUPE
San Antonio River
Sd
Sp
NUECES
Nueces River
Corpus Christi
Flood Inlet
MEXICO
GULF
OF
W
E
S
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Study Project
Area Study, Flood Control
Area Study, Irrigation
Area Study, Pollution
Basin Wide Study, Drainage
Basin Wide Study, Flood Control
Basin Wide Study, Irrigation
Basin Wide Study, Power
Basin Wide Study, Water Supply
Construction Project
Projects shown include only those ready for immediate construction.
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

The problems of the western Gulf drainage areas include (1) flood control; (2) provision of fresh-water supplies for irrigation, municipal, and industrial purposes along the coast; (3) conservation of water for irrigation in the subhumid section; (4) development of underground water supplies where there is little surface run-off; (5) correction of pollution from sewage, and from oil well and refinery wastes; and (6) settlement of conflicts over the waters of some of the streams. Improvement and extension of existing navigation facilities also are important.

1. Intense local storms and flashy, violent floods are characteristic of much of the region. Thus in June 1935 the Nueces River developed a peak flow estimated at 600,000 second-feet as a result of intense precipitation over a drainage area of 400 square miles. The provision of adequate flood-control works in the Trinity, Brazos, Colorado, Guadalupe, Nueces, and Lower Rio Grande Basins is important.

Local interests have built a disconnected, inadequate system of levees along the Trinity and Brazos Rivers for the protection of agricultural lands. Additional reservoirs and a coordinated system of levees are needed in both basins. Some 13 reservoirs have been proposed by the Brazos River Conservation and Reclamation District to provide flood control and to generate hydroelectric power. One dam is ready for construction, and the proposed sites for the others are being investigated. Four of the dams, located at strategic points, should be constructed as soon as the investigation is completed.

The Lower Colorado River Authority, with the aid of the United States Bureau of Reclamation, is constructing three dams on the Colorado River for flood control and power generation. Additional funds are needed to enlarge one of these dams to provide greater storage capacity. In addition to the reservoirs, levees will be required from Columbus to the Gulf to afford protection for the agricultural lands of the valley. More water for the irrigation of rice near the mouth of the river would be provided incidentally by the reservoirs.

Reservoirs hitherto suggested for tributaries of the Guadalupe River are believed to be inadequate to control floods in the entire basin. Large floods originate below the sites of some of the proposed dams, and a restudy of the flood problem of the basin is recommended.

It will become important in time to achieve maximum conservation of all water in the Nueces River Basin, both from underground and surface sources, for use in irrigation. More land there is adaptable to irrigated agriculture than can be served by the water now available. The flow of the streams is erratic, and much water is lost in crossing the Balcones Fault zone. The preliminary examination of the basin now being made should be followed by a complete study to devise the most effective means not only of controlling floods but also of conserving water for irrigation.

A comprehensive system of levees and floodways for flood control along the lower Rio Grande has been designed and laid out by the International Boundary Commission. Approximately half the system has been constructed. Funds should be made available for completion of the works.

2. Much rice is grown by irrigation in the eastern part of the district, both in Louisiana and Texas. During frequent periods of low-stream flow, salt water from the Gulf causes heavy losses of rice. The construction of projects to supply fresh water for rice culture and other purposes near the mouths of the Mermentau, Sabine, and Neches Rivers is recommended.

3. In the parts of the Colorado and Brazos River Basins which lie below the High Plains and above the 25-inch annual rainfall line, conservation of water for irrigation will become important soon or later. A study should be made of this section to devise the most logical plan of water development for that purpose.

4. In the High Plains areas, and to considerable extent in the Pecos River Basin, similar studies are needed in connection with underground water supplies.

5. The most serious pollution problem in the entire district is along the Trinity River. During periods of low flow, the river below Dallas is virtually an open sewer. This condition should be corrected by improvement and enlargement of the sewage-disposal plant at that city. Additions also should be made to the sewerage systems of Houston and many smaller municipalities.

6. The use of the water of the lower Rio Grande is a matter of international concern. A large part of the water originating in the basin below Fort Quitman comes from tributaries in Mexico. A very small part of the unused water passing from the river into the Gulf originates in the United States. Rapid development of irrigation in Mexico foreshadows serious depletion of supplies of water necessary for the 400,000 acres of land in Texas already irrigated in the lower valley. Prospective shortages can be obviated only by major reservoir construction on the main stream. Such con-

struction cannot be undertaken, however, without international agreement and cooperation. Meanwhile, an essential fact-finding study is recommended to determine water uses and water supplies in Texas along the river below Fort Quitman.

A compact should be negotiated between New Mexico and Texas to provide for the most efficient use of the waters of the Pecos River. A fact-finding investigation is recommended to form a basis for compact negotiations.

Due largely to the great quantities of oil produced in the district, its ports rank among the more important of the country. Improvements already authorized by the Congress should be made on the Houston Ship Channel and the Sabine-Neches Waterway. The Intracoastal Canal should be extended to Corpus Christi.

Western Gulf Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Sabine:		
Pollution:		
Study to devise means for control of stream pollution by salt water from oil wells	$50,000	
Water Supply:		
Rockland Dam Project: Tyler County, Tex.: Study for supplemental water supply in Jefferson County.	50,000	Preliminary report prepared. Study to consist of dam site exploration and water supply and economic studies.
Trinity:		
Drainage:		
Chambers and Liberty Counties, Tex.: Study for drainage	50,000	Preliminary plans for mapping project completed.
Flood Control:		
Houston, Tex.: Study for protection from flood damages due to high waters of Buffalo Bayou	60,000	Two projects undertaken by W. P. A. Coordinated plan needed. Estimate approximate. Study authorized by Congress.
Trinity River, Tex.: Plan to protect 750,000 acres fertile alluvial land and reduce present damages from high waters.	500,000	Extension of prelimary examination by Corps of Engineers.
Brazos-Colorado:		
Flood control:		
Brazos River, Tex.: Study of flood control by means of levees, also topographic mapping for the Lower Brazos.	175,000	Plans made.
Matagorda and Wharton Counties, Tex.: Topographic mapping and study of levee design for flood control of the lower Colorado River	175,000	Do.
Study to devise plans for flood control and irrigation through topographic surveys, examination of reservoir sites, water supply studies, etc., in area between Caprock and the 25-inch annual rainfall line in this basin.	250,000	Corps of Engineers authorized to make examination and report on part of this area in the Colorado River Basin. Study to expand scope and area of preliminary examination. Estimated cost approximate.
Guadalupe:		
Flood control, irrigation, navigation, and water power:		
Study of the coordinated utilization of the water resources of the Guadalupe, San Antonio, and Lavaca Basins for flood control, water power, irrigation, and navigation.	100,000	Continuation of study made by Corps of Engineers.
Lower Rio Grande-Pecos:		
Drainage:		
Study of the lower valley of the Rio Grande River to form basis for design of needed drainage system, including topographic mapping, and water table and seepage investigations.	75,000	Preliminary plans for study completed.
Water supply:		
Study to determine the interstate phases of the Pecos River and the facts in regard to water supply and uses, which will form a basis for compact negotiations between New Mexico and Texas.	75,000	Estimated cost approximate.
Study of water uses and water supply in Texas along the lower Rio Grande (below Fort Quitman)	200,000	Factual data now in hand should be supplemented and extended in cooperation with State of Texas.
2. Construction Projects		
Sabine:		
Navigation:		
Sabine-Neches Waterway, Jefferson and Orange Counties, Tex.: Channel enlargement from Sabine Pass to Port Arthur, Beaumont, and Orange.	1,790,000	Plans completed to complete immediate project.
Pollution:		
Lake Charles, La.: Intercepting sewer and sewage treatment plant	160,000	Preliminary plans made.
Sulphur, La.: Sewer system and sewage treatment plant	86,000	Do.
Pollution and water supply:		
Cushing, Tex.: Waterworks, sewer system, and sewage treatment plant	60,000	Do.
Recreation and wildlife:		
Boykin Springs, Tex.: Dam for recreation purposes	18,000	
Lake Charles, La.: Sabine migratory waterfowl development; dikes to keep out salt waters; buildings and equipment	144,000	Surveys in progress.
Water supply:		
Brownsboro, Commerce, Garrison, Lindale, Newton, and Tatum, Tex.: Water supply or improvements.	120,000	Preliminary plans made.
Trinity:		
Navigation:		
Cedar Bayou, Tex.: Channel dredging	12,000	Work in progress. Sum needed to complete.
Houston, Tex.: Ship channel to Galveston Bay, to be dredged to 34 feet in depth and width increased.	2,900,000	Cost given is for first 2 years. Additional needed to complete, $614,000. Authorized by Congress
Pollution:		
Dallas, Tex.: Sewer and sewage treatment improvements	1,320,000	Preliminary plans made.
Houston, Tex.: Sewer and sewage treatment improvements	909,000	Do.
Jewett, Tex.: Sewage treatment plant	16,000	Do.
Pollution and water supply:		
Centerville, Mesquite, and Oakwood, Tex.: Waterworks and sewer system improvements	121,000	Do.
Water Supply:		
Eustace, Grapevine, Lancaster, Pilot Point, Prosper, and Rhome, Tex.: Waterworks improvements	133,000	Do.
Highland Park, Tex.: Water system improvements	285,000	Do.
Houston, Tex.: Water system improvements	1,000,000	Do.
Brazos-Colorado:		
Erosion (coastal):		
Freeport, Tex.: Concrete mat revetment	44,000	Do.
Flood control, irrigation, and water power:		
Marshall Ford, Tex.: Reservoir dam to be raised to provide extra capacity for flood control, power, and irrigation.	8,000,000	Plans practically complete. Cost given is for next 2 years. Additional needed to complete, $13,750,000.
Flood control and water power:		
Palo Pinto County, Tex.: Possum Kingdom Dam for flood control and power	6,600,000	Amount needed to complete.

Western Gulf Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Brazos-Colorado—Continued.		
Pollution:		
Hobbs and New Hobbs, N. Mex.: Sewer system and sewage treatment plant	$159,000	Preliminary plans made.
Muleshoe, Tex.: Sewer system	32,000	Preliminary plans made. System needed but cost excessive. Requires restudy.
Round Rock, Tex.: Sewer system with sewage treatment plant	47,000	Do.
Pollution and water supply:		
Aspermont, Benjamin, Burleson, Calvert, Hempstead, Lexington, Sudan, Taylor, and Tehuacana, Tex.: Water supply and sewer systems.	230,000	Preliminary plans made.
Bangs, Tex.: New filtration galleries and pumps for water supply; sanitary sewers and sewage treatment plant.	31,000	Preliminary plans made. Requires restudy because of excessive cost.
Eldorado, Tex.: Waterworks and sewer system including sewage treatment plant	105,000	Preliminary plans made.
Kosse, Tex.: Water supply from well; sewer system and sewage treatment plant	58,000	Do.
Recreation and wildlife:		
Bay City, Tex.: Wild fowl refuge; facilities and water control works	42,000	Plans completed.
Muleshoe, Tex.: Muleshoe wild fowl refuge; housing facilities and water control works	33,000	Do.
Water supply:		
Big Spring, Tex.: Water supply reservoir, pipe line; tanks and filtration plant	500,000	Preliminary plans made.
Elgin, Tex.: Water supply system	13,000	Do.
Hamlin, Tex.: Reservoir, additional filters and improvement of present filters	145,000	Preliminary plans made. Requires further study.
Temple, Tex.: Extension of mains and new storage reservoir for water supply	65,000	Sketch plans made.
Winters, Tex.: Dam, pumping equipment, and treatment plant for domestic water supply	84,000	Preliminary plans made. Requires restudy.
Guadalupe:		
Drainage:		
San Antonio, Tex.: Drainage of flying field	120,000	Preliminary plans made.
Pollution and water supply:		
Ganado, Tex.: Waterworks and sewer system	54,000	Preliminary plans made. Requires restudy.
Recreation and wildlife:		
Rockport, Tex.: Migratory bird refuge: Improve existing facilities	56,000	Preliminary plans made.
Water supply:		
Kyle, Tex.: Waterworks	38,000	Preliminary plans made. Requires restudy.
Nueces:		
Navigation:		
Sabine River to Corpus Christi, Tex: Intracoastal waterway	3,900,000	Cost given is for first 2 years. Additional needed to complete, $1,500,000. Authorized by Congress.
Pollution:		
Devine and Odem, Tex.: Sewer systems and sewage treatment plants	67,000	Preliminary plans made.
Water supply:		
Alice, Tex.: New well and improvements to water supply system	98,000	Do.
Carrizo Springs, Tex.: Deep well and extensions to water supply system	46,000	Do.
Rocksprings, Tex.: Water supply system	26,000	Do.
Lower Rio Grande-Pecos:		
Flood control:		
Lower Rio Grande Valley, Tex.: Flood control by levees and floodways	3,290,000	Levees and flood ways more than half completed. Amount needed to complete.
Irrigation:		
Fort Sumner, N. Mex.: Alamogordo dam on Pecos River 15 miles above Fort Sumner to replace capacity of Lake McMillan depleted by silt. Lining of irrigation canals to prevent seepage losses.	400,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $200,000.
Pollution:		
Fort Sumner, N. Mex.: Replacement of old sewer system	60,000	Plans being prepared.
Santa Rosa, N. Mex.: Replacement of old sewer system	35,000	Do.
Wink, Tex.: Sewer system and sewage treatment plant	51,000	Preliminary plans in preparation.
Water supply:		
Port Isabel, Tex.: Water supply purification plant and extension of mains	75,000	Preliminary plans made.
Rankin, Tex.: Improvements to water supply system	40,000	Do.
Sonora, Tex.: Water supply system	93,000	Do.
GROUP B—FOR DEFERRED CONSTRUCTION		
Sabine:		
Flood control:		
Sabine-Neches conservation district: Study of flood control and water conservation by means of dams and reservoirs and by channel improvements.	$250,000	General study project authorized by Congress. Directed at specific construction project proposed by Sabine-Neches Authority. To be an expansion of preliminary examination now under way by Corps of Engineers.
Irrigation:		
Mermentau River fresh water project, Louisiana: Stream control, and channel improvement for irrigation. Locks for control of salinity.	1,400,000	Preliminary report made by Corps of Engineers.
Pollution:		
Beckville, Tex.: Sewer system and sewage treatment plant	18,000	Preliminary plans made. Requires further study.
Pollution and water supply:		
Celeste, Tex.: Water supply system, sewer system and sewage treatment plant	65,000	Do.
Water supply:		
Beckville, Caddo Mills, Joaquin, and Mount Enterprise, Tex.: Water supply systems	126,000	Do.
Tenaha, Tex.: Water supply system	56,000	
Trinity:		
Pollution:		
Bryson, Dawson, Normangee, Roanoke, and Seagoville, Tex.: Sewer systems	145,000	Preliminary plans should be revised before construction.
Pollution and water supply:		
Alvord, Athens, and Rice, Tex.: Waterworks and sewer system improvements	203,000	Do.
Cleveland, Tex.: Waterworks system and sewage treatment plant	129,000	Preliminary plans made. Proposed water system requires further study.
Water supply:		
Blue Ridge, Tex.: Waterworks system	29,000	Preliminary plans should be revised before construction.
Waxahachie, Tex.: Water supply reservoir and pipe line	273,000	Preliminary plans made. Excessive cost requires further study.
Brazos-Colorado:		
Flood control:		
Bell County, Tex.: Lampasas Reservoir	1,355,000	Under study. Estimate of cost approximate.
Bell County, Tex.: Leon Reservoir	2,382,000	Do.
Madison County, Tex.: Navasota Reservoir	2,143,000	Do.
Stephens County, Tex.: Breckenridge Reservoir	2,385,000	Do.
Irrigation:		
Coleman, Tex.: Central Colorado Authority project; 3 small reservoirs for domestic stock, and irrigation use.	567,000	Preliminary plans made.

Western Gulf Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Brazos-Colorado—Continued.		
Water supply:		
Abilene, Tex.: Domestic water supply improvements	$614,000	Preliminary plans made. Requires further study.
Colorado, Tex.: Reservoir, filtration plant, pipe line, and pumping station for water supply	184,000	Preliminary plans made. Requires restudy because of excessive cost.
Hempstead, Tex.: Water supply system	60,000	Preliminary plans made. Requires further study.
Smithville, Tex.: Deep well, surface reservoir, elevated tank, and distribution system for water supply.	185,000	Preliminary plans made. Requires restudy because of excessive cost.
Guadalupe:		
Water supply:		
Rockport, Tex.: Water supply system, sewer system and sewage treatment plant	102,000	Do.
Nueces:		
Pollution and water supply:		
San Diego, Tex.: Water supply system, sewer system and sewage treatment plant	158,000	Do.
Miscellaneous:		
Study to provide plan for control and development of water resources throughout entire basin	500,000	Preliminary examination under way
Lower Rio Grande-Pecos:		
Navigation:		
Harlingen, Tex.: Completion of light draft channel between Port Isabel and Harlingen	300,000	Plans completed.
Water supply:		
Barstow, Tex.: Water supply	51,000	Preliminary plans made. Requires restudy.

COLORADO BASIN

The basin of the Colorado River embraces parts of seven States, together with a small area in Mexico. The mountainous rim of the upper basin has a moderately heavy precipitation, cold winters, and a short, hot growing season. The lower basin is very arid, has mild winters and hot summers, and is favored by a growing season that lasts throughout the year. No crops can be grown successfully anywhere in the basin without the artificial application of water. The urban population of the basin in 1930 was 225,000; the rural, 552,000. A population of 1,120,000, urban and rural, has been predicted for 1960.

Recreational opportunities within the basin are excellent. The mountainous northern country contains natural parks and forests, with clear, fish-stocked lakes and rivers, and with national monuments and varied resorts for the summer months. The southland invites the tourist to its national parks of unsurpassed grandeur—Zion and Bryce Canyons, Cedar Breaks, and the superb Grand Canyon of the Colorado.

The annual discharge of the Colorado River system varies between 4 and 26 million acre-feet. Storage of water is necessary to make this highly variable supply available for human use through river regulation. In order to provide for such regulation, six of the seven States entered into a compact which makes blanket apportionments of Colorado River waters to the upper and lower basin States. The Boulder Canyon Project Act, supplementary to the Colorado River compact, authorized the construction of the Boulder Canyon Dam and power plant and the excavation of the All-American Canal. This multiple-purpose project, involving river regulation for navigation and flood control, provision of water for municipal use and for irrigation, and the development of power, is the key to future development in the basin.

The silt problem continues to be one of the more serious problems of the basin. The Colorado River has carried annually 200 million tons of sediment to the Gulf, and every reservoir built upon the system will be slowly robbed of its storage space unless remedial measures are applied. The cost of handling silt in the lower irrigation projects has run into millions of dollars each year; from this cost, however, Lake Mead will afford material relief. The Colorado Basin affords an excellent opportunity for an exhaustive study of the silt problem in all of its phases. Such a study should extend over a period of years and should be carried on under cooperative arrangements made by the various Federal and State agencies concerned with the problem. The findings of the investigation would be of great value, not in this basin alone, but wherever silt problems exist.

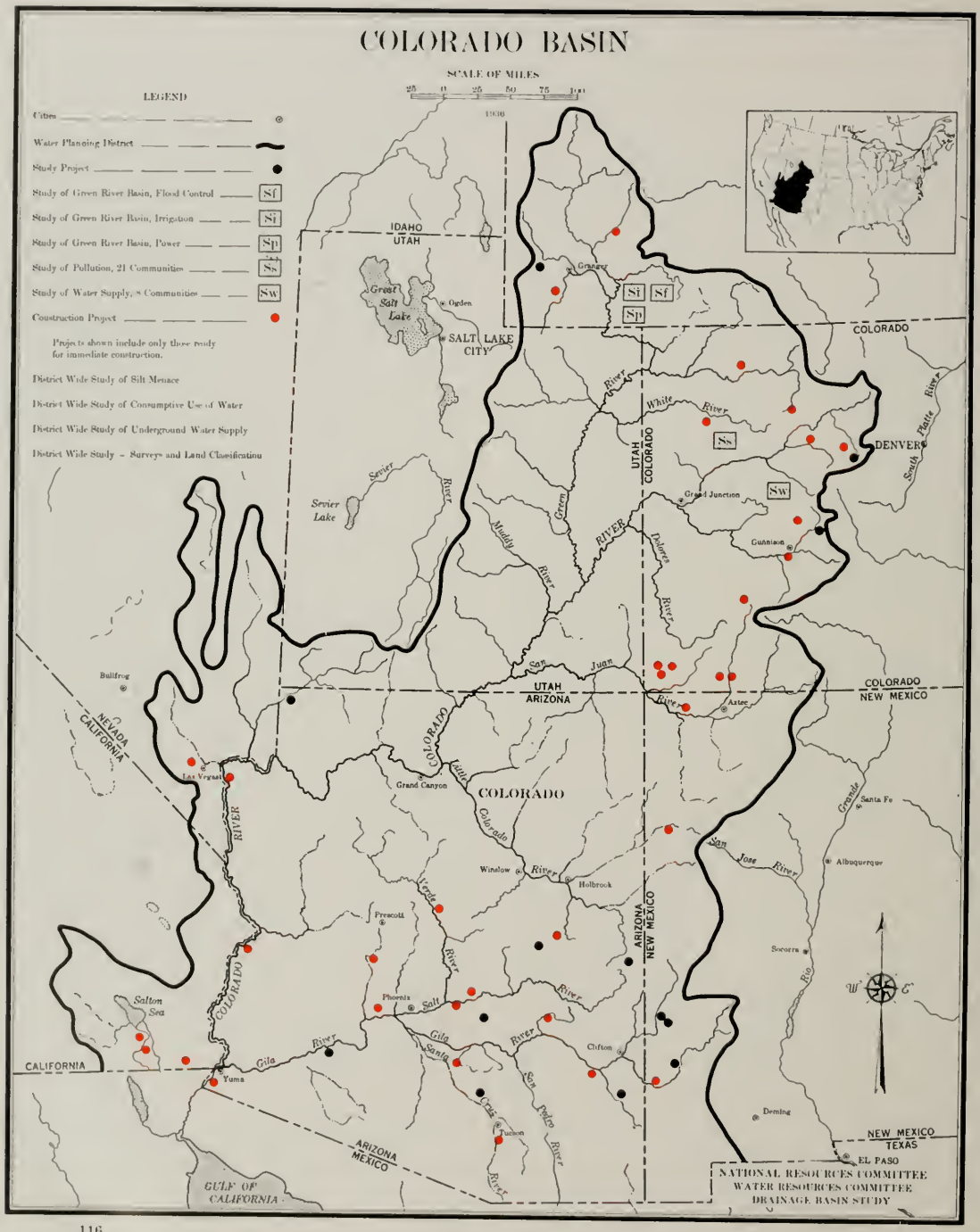
The Colorado River compact makes the consumptive use of water (diversions less return waters) the measure and limit of allocations of the waters of the river. The several States involved must allot among themselves the blanket apportionments specified by the compact. This cannot be done without full knowledge of the water consumed in irrigation, of evaporation from reservoirs, of the water that can be economically exported from the basin, and of the contributions and consumptive uses by each State under past, present, and final conditions of development. Data essential for the solution of the many problems involved must come from studies and measurements of erosion, the quality of water, stream flow, underground waters, the consumptive use of water, the effect of forests on water supply, and from surveys for reservoirs, irrigation projects, power sites, and transmountain diversions.

The water resources of the Colorado Basin have been studied heretofore largely in terms of State and municipal interests. They should be studied likewise in terms of the basin as a whole, in terms of interbasin relationships, in terms of national welfare, and in terms of international relations, with due regard to the various interests involved and in the light of all relevant economic and cultural conditions. The fact, for example, that diversions of water from the basin that have been made or proposed amount to several million acre-feet annually, raises questions of interregional and national scope.

The projects listed for the Colorado Basin are divisible into three groups. The first is the Boulder Canyon group, those pertaining to the main Colorado and those downstream from Boulder Dam. They constitute a well-coordinated system, supplemental to and dependent upon the Boulder Canyon project.

The second group relates to municipal improvements, irrigation, flood control, and recreational projects that are situated away from the main stream and that are related only remotely to the Boulder Canyon project. They are dependent upon the general social developments within the basin, which the first group will stimulate.

The third group is concerned with the procurement of physical data so essential in character that the general development of the basin cannot proceed along rational and economic lines without them.


COLORADO BASIN
SCALE OF MILES
25 0 25 50 75 100
LEGEND
Cities
Water Planning District
Study Project
Study of Green River Basin, Flood Control Sf
Study of Green River Basin, Irrigation Si
Study of Green River Basin, Power Sp
Study of Pollution, 21 Communities Ss
Study of Water Supply, 8 Communities Sw
Construction Project
Projects shown include only those ready for immediate construction.
District Wide Study of Silt Menace
District Wide Study of Consumptive Use of Water
District Wide Study of Underground Water Supply
District Wide Study – Surveys and Land Classification
IDAHO
UTAH
Great Salt Lake
Ogden
SALT LAKE CITY
Grassy
Si Sf
Sp
COLORADO
White River
Ss
DENVER
South Platte River
Sevier River
Sevier Lake
UTAH
COLORADO
Grand Junction
Sw
Gunnison
Green RIVER
Duchesne River
Muddy River
San Juan River
Bullfrog
UTAH
ARIZONA
COLORADO
NEW MEXICO
Aztec
NEVADA
CALIFORNIA
Las Vegas
COLORADO RIVER
Grand Canyon
Little Colorado River
COLORADO
Winslow
Holbrook
Verde River
Prescott
Santa Fe
Rio Grande
San Jose River
Albuquerque
ARIZONA
NEW MEXICO
Socorro
Salton Sea
Phoenix
Salt River
Gila River
Clifton
CALIFORNIA
Yuma
Santa Cruz River
San Pedro River
Tucson
Deming
NEW MEXICO
TEXAS
EL PASO
ARIZONA
MEXICO
GULF OF CALIFORNIA
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

The proper sequence of development for the Boulder Canyon group of projects is apparent. When power demands increase sufficiently, Bullshead Reservoir will be necessary to hold water released from Lake Mead solely for power purposes until it is required for irrigation later in the season. Parker Reservoir, now under construction, will also be used for reregulation. Upstream flood-storage reservoirs will preserve space in the reservoir above Boulder Dam and make that space available for storage of silt. Other upstream reservoirs on silt-laden tributaries will be built primarily for storage of silt to preserve the integrity of Lake Mead. Dependent also upon the Boulder Canyon project are the developments downstream from Lake Mead, including the Metropolitan Aqueduct, the Imperial, Coachella, and Palo Verde irrigation projects in California, and the Colorado River Indian, Yuma, and Lower Gila developments in Arizona.

Colorado Basin Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Colorado:		
Erosion, flood control, and irrigation:		
Little Colorado River in New Mexico and Arizona: Comprehensive investigation for irrigation, flood control, silt, storage, soil conservation, and forestry.	$75,000	Preliminary data available.
Flood control:		
Sentinel Reservoir: Study of effect of Gila floods on lands of Colorado River delta	30,000	Preliminary plans and some foundation explorations made.
Flood control and irrigation:		
Santa Cruz and San Simon River Basins, Ariz.: Investigations for flood control and irrigation	75,000	Preliminary data available.
Flood control, irrigation, and power:		
Complete the physical and economic investigations of Cliff Reservoir, Grant County, and Alma Reservoir, Catron County, N. Mex., for storage required to reduce floods, provide water for irrigation, and develop power.	20,000	A study and report was made by Bureau of Reclamation but without final conclusion; it recommended further investigations.
Tri-State investigations on Green River in Wyoming, Utah, and Colorado: Study for irrigation, power, and flood control, prior to creation of Ladore Game Preserve.	50,000	This area proposed as a game preserve.
Irrigation:		
Colorado-Arkansas River diversion: Study to determine practicability of diverting headwaters of Gunnison and Frying Pan Rivers to the Arkansas River Basin and feasibility of Tennessee Pass tunnel, for irrigation.		This study with its estimated cost is listed among southwest Mississippi Basin projects.
Green River and Bear River, southwest Wyoming and north Utah: Study of diversion from Green River in Colorado Basin to supplement supply for irrigation along Bear River in the Great Basin.		See the Great Basin list, for cost estimate.
Queen Creek irrigation, eastern Maricopa County, Ariz.: Queen Creek to be spread to replenish ground waters.	20,000	Project studied 30 years ago by Bureau of Reclamation.
Round Valley Water Users Association, Arizona: Repairs and construction for irrigation system	3,000	Preliminary plans completed.
Upper Colorado River: Continuing investigations, surveys, and land classification, as contemplated in sec. 15 of the Boulder Canyon Act.	500,000	
Irrigation and water supply:		
Blue River diversion, Summit County, Colo.: Study needed of economic feasibility of diverting water from Colorado Basin to Missouri Basin.		Sum needed to complete this study is listed among Missouri Basin projects.
Pollution:		
Aspen, Breckenridge, Delta, Fruita, Glenwood Springs, Grand Junction, Gypsum, Hayden, Hotchkiss, Ignacio, Meeker, Montrose, Oak Creek, Olathe, Ouray, Palisade, Paonia, Red Cliff, Rifle, Silverton, and Telluride, Colo.: Investigations for sewage-treatment plants.	25,000	Sewage treatment ordered by State board of health.
Water supply:		
DeBeque, Colo.; Fredonia, Ariz.; Fruita, Ignacio, New Castle, Norwood, Nucla, Pagosa Springs, and Palisade, Colo.; and Mogollon, N. Mex.: Investigation for sources of supply, purification, and improvements to domestic water supplies as may be required.	15,000	Some towns are without adequate fire protection, some require new supplies, others desilting and purification works.
Investigation of underground waters (quantity and chemical quality) in various areas scattered throughout the basin.	300,000	A study extending over a period of years and probably costing a million dollars.
Miscellaneous:		
Mesquite Reservoir near Littlefield, Mohave County, Ariz.: Reservoir to store floods for supplemental irrigation use and to retain silt from Lake Mead.	8,000	Preliminary studies made.
Silt study, Colorado River drainage area: Study of origin of silt and alleviation of silt menace in basin	1,000,000	Total cost will run to several millions and extend over 25 years or more.
Research on consumptive use of water in Colorado River Basin	200,000	A 20-year study to cost a million dollars or more.
2. Construction Projects		
Colorado:		
Drainage:		
Malaria control, San Juan County, N. Mex.: Draining and filling mosquito breeding areas, San Juan Valley.	43,000	Plans completed.
Irrigation:		
All-American Canal, Calif., including Coachella main canal	3,000,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $8,500,000.
Colorado River Indian Reservation project: Diversion dam, irrigation canals, and pumping unit	3,000,000	General plans completed and lands classified. Cost given is for next 2 years. Additional needed to complete, $7,000,000.
Eden irrigation project, Sweetwater County, Wyo.: Reservoir for supplemental supply	1,000,000	General plans and land classification completed.
Lower Gila irrigation project, Yuma County, Ariz.: First unit of project, including Parker power plant. Pumping from main canal to irrigate 150,000 acres.	3,500,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $13,950,000.
Lyman irrigation project, Uinta County, Wyo.: Reservoir for supplemental supply	1,000,000	General plans and land classification completed.
Montezuma irrigation project, Montezuma County, Colo.: Diversion by present tunnel from Dolores River. Reservoir for supplemental supply.	2,000,000	General study completed.
Pine River irrigation project, La Plata County, Colo.: Storage reservoir for supplemental supply	1,300,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $300,000.
Roosevelt irrigation district, Maricopa County, Ariz.: Lining canals, flumes, and spillways with gunite.	605,000	Plans completed.
Salt River irrigation project, Ariz.: Bartlett Storage Dam on Verde River and canal improvements	1,200,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $494,000.
White Mountain Apache Reservation in Navajo, Apache, Gila, and Graham Counties, Ariz.: Rehabilitation of irrigation system.	35,000	Cost given is for first 2 years. Additional needed to complete, $75,000.
San Carlos Indian irrigation project, Gila County, Ariz.: Canal improvements	25,000	Plans completed.
Sanpete County, Utah: Diversion tunnel to divert Cottonwood Creek from Colorado Basin to San Pitch Watershed in the Great Basin for irrigation.		This project with its estimated cost is listed among the Great Basin projects.
Virden Dam, Grant County, N. Mex.: Diversion dam to supplement supply for irrigation in New Mexico and Arizona.	50,000	Preliminary plans completed.
San Xavier, Pima County, Ariz.: Wells, pumps, and irrigation distribution system	288,000	Plans completed.

Colorado Basin Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Colorado—Continued.		
Irrigation and water supply:		
Papago Indian domestic and stock-water development, Pinal and Pima Counties, Ariz.: Sink 8 wells, install pumps, and improve irrigation structures.	$53,000	Plans completed. Cost given is for next 2 years. Additional needed to complete, $79,000.
Pollution:		
Durango, Colo.: Partial sewage-treatment plant	50,000	Plans completed.
Eagle, Colo.: Sewage-treatment plant	11,000	Do.
Gunnison, Colo.: Partial-treatment plants	12,000	Do.
Wickenburg, Ariz.: Pipe line and sewage-treatment plant	38,000	Do.
Pollution and water supply:		
Imperial, Calif.: Outfall sewer and filtration plant	111,000	Preliminary plans made.
Water supply:		
Breckenridge, Colo.: Storage reservoir and supply system	17,000	General plans completed.
Cortez, Colo.: Waterworks improvements	100,000	Detailed plans and specifications completed.
Craig, Colo.: Filter plant	20,000	Detailed plans completed.
Crested Butte, Colo.: Storage reservoir	11,000	Plans completed.
Dolores, Colo.: Waterworks improvement	100,000	Do.
Gallup, N. Mex.: Water supply	218,000	Preliminary plans made.
Meeker, Colo.: Replacement of old wooden pipe line	54,000	Do.
Mesa, Ariz.: Water mains	74,000	Plans completed.
North Las Vegas, Nev.: Waterworks improvement	35,000	General plans completed. Details lacking.
Ridgway, Colo.: Replacement of pipe lines	43,000	Plans completed.
Safford, Ariz.: Purchase of privately owned system and construction of supplementary works	496,000	Preliminary plans completed. Final plans 50 percent completed.
Yampa, Colo.: Filter plants and replacement of old pipe	40,000	Surveys and detail plans completed.
Water power:		
Boulder Canyon Dam, Arizona-Nevada	4,000,000	Dam is finished. Power plant under construction. Cost given is for next 2 years. Additional needed to complete, $2,740,000.
Imperial irrigation district, Calif.: Power plants and distribution system. Foundations being built at drops in All-American Canal.	2,000,000	Plans 90 percent completed. Cost given is for next 2 years. Additional needed to complete, $2,662,000.
GROUP B—FOR DEFERRED CONSTRUCTION		
Colorado:		
Flood control:		
Meadow Valley flood diversion project near Overton, Clark County, Nev.: Earth dam to divert floods over wide plain.	$100,000	Plans completed.
Irrigation:		
Colorado-Big Thompson transmountain diversion of water from Colorado Basin to Missouri Basin for supplemental irrigation supply.		This project, with its estimated cost, is listed among Missouri Basin projects.
Duncan Valley irrigation project, Greenlee County, Ariz.: Improvements of system by wells and pumping equipment.	80,000	Preliminary plans completed.
Florida Mesa irrigation project near Durango, La Plata County, Colo.: Storage reservoir for supplemental supply.	1,000,000	Land classification completed. Cost given is for first 2 years. Additional needed to complete, $1,000,000.
La Plata irrigation project, La Plata County, Colo.: Building 2 dams and enlarging third to supplement supply.	1,039,000	Plans nearly completed.
Mancos irrigation project, Montezuma County, Colo.: Storage reservoir for supplemental supply	600,000	Investigations and land classification nearly completed.
Paonia irrigation project in Delta and Gunnison Counties, Colo.: Storage reservoir for supplemental supply.	1,000,000	Plans in preparation. Cost given is for first 2 years. Additional needed to complete, $3,000,000.
Roan Creek irrigation project near DeBeque, Garfield County, Colo.: Supplemental water for irrigation.	500,000	Final plans in preparation. Cost given is for first 2 years. Additional needed to complete, $500,000.
Smith Fork irrigation project near Hotchkiss, Delta County, Colo.: Reservoir for supplemental supply.	500,000	Plans in preparation.
Upper Yampa Reservoirs near Yampa, Colo.: Supplemental supply and new land irrigation	1,000,000	General plans completed.
Utah and Wasatch Counties, Utah: Diversion works to divert Duchesne River from Colorado Basin to Provo River in the Great Basin, for irrigation and water supply.		This project, with its estimated cost, is listed among the Great Basin projects.
Irrigation and water supply:		
Camelback water conservation district, Maricopa County, Ariz.: Irrigation works, pumping plant, power and pipe line for irrigation and domestic purposes.	335,000	Plans completed.
Water supply:		
Globe, Ariz.: Replacement of pipe line	68,000	General plans completed.
Tucson, Ariz.: Waterworks improvements	501,000	Preliminary plans completed. Final plans in preparation.

Scarcity of water has limited the utilization of the land resources of the Great Basin. The stabilization of agricultural and manufactural activities in this arid, intermontane area and its further economic development both will hinge in large measure upon the degree to which meager surface supplies of water can be conserved, new underground supplies can be discovered and utilized, and additional supplies can be imported from the Colorado Basin.

Although no water which falls in the Great Basin flows to the sea, the volume of water flowing in streams to inland lakes and alkali "sinks", or accumulating in valley fills, is insufficient to serve many current needs, not to mention prospective needs. The normal flows in most of the streams which together drain the numerous small basins are utilized completely or almost completely for irrigation and for municipal purposes. The waters of Provo River and of other streams draining into Great Salt Lake are fully appropriated. The streams naturally tributary to Humboldt Sink are entirely diverted for irrigation in normal years; some of their water reaches the sink only in rare years of excessive rainfall. Various streams in southeastern Oregon, western Nevada, and southeastern California likewise are put to complete use for the irrigation of cash crops or of forage for livestock grazed on adjacent pastures. In many subbasins more land is irrigated than can be served adequately with water in some years, and farmers are subject to recurring shortages and crop losses. In various valleys, such as Malad Valley in Idaho, a precarious financial condition has resulted from the overexpansion of farming in years of relatively plentiful stream flow. Grazing of livestock in the scant pastures of the long, barren valleys of the desert floor and on the slopes of the intervening mountain ranges is restricted in many places by lack of suitable water holes. From time to time, Salt Lake City, Ogden, and other municipalities have experienced a shortage of water for domestic purposes. Lack of fresh water for condensing purposes has prevented large-scale generation of power from Utah coal. Even feeding grounds for migratory waterfowl are at a premium. A population only equal in number to that of Rhode Island finds barely enough water to meet current needs in an area comprising one-fifteenth of the United States.

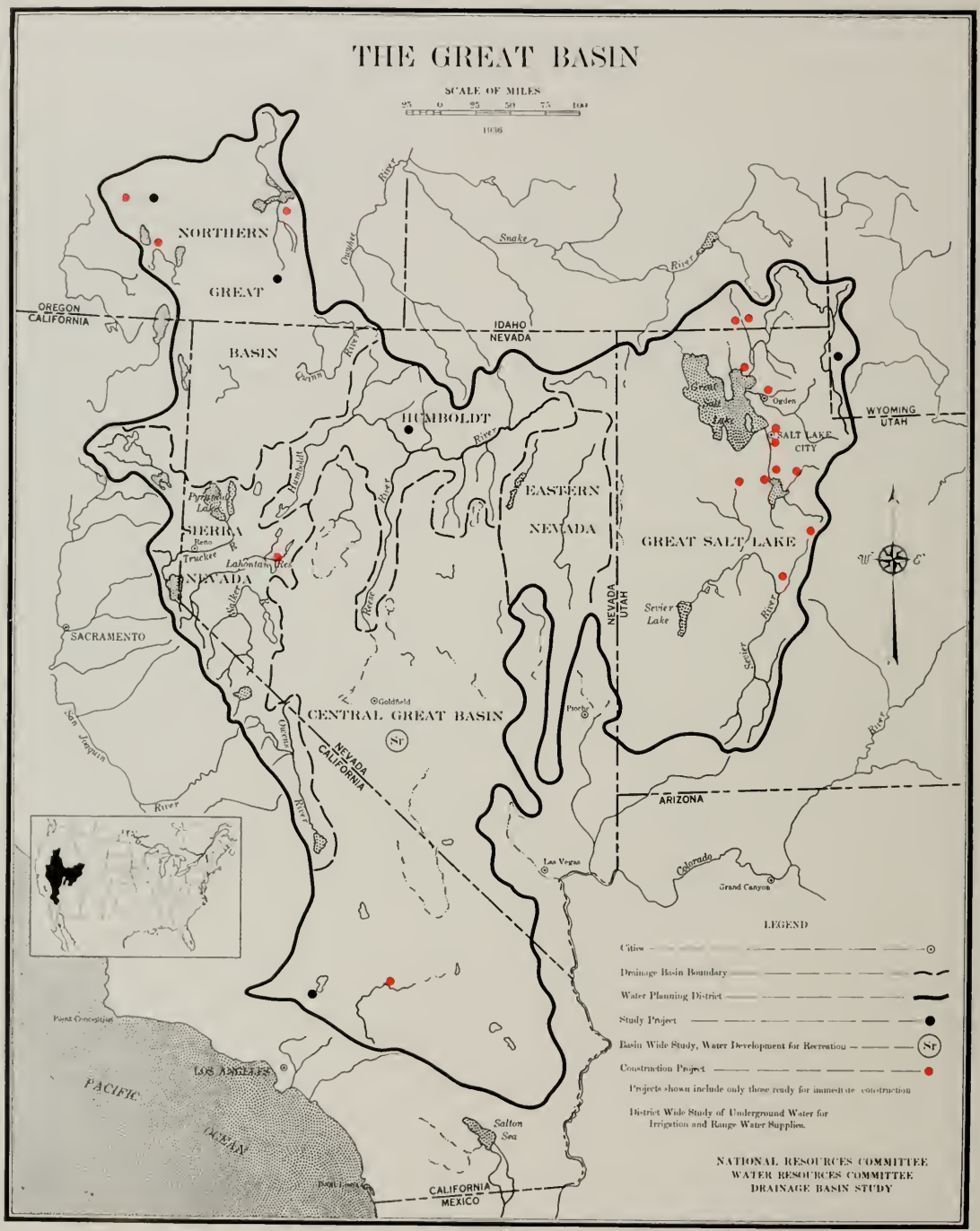
The practicable means of obtaining more water in the Great Basin at reasonable expense include (1) additional surface storage, (2) reduction of losses from river channels and lakes, (3) elimination of waste in applying water to land, (4) utilization of underground waters, and (5) diversion of water from other basins having superabundant supplies.

1. With the completion of Boca Reservoir on Little Truckee River, only a small number of economically feasible storage projects will remain. They are of small size and only a few in the Wasatch Mountains and the Sierra Nevada have possible collateral use for generation of power.

2. There are, however, fruitful possibilities of increasing the available supply of surface water by improving stream channels to reduce seepage losses and by constricting lake areas to reduce evaporation losses. Studies of channel improvement plans for the Humboldt and Little Humboldt Rivers should be completed. The Utah Lake diking project is needed to prevent undue loss of fresh water from the Provo drainage, where a large storage reservoir (the Deer Creek Reservoir) is planned for early construction. It would conserve water as part of a comprehensive program to supplement supplies for Salt Lake City and adjacent areas by storage works combined with diversion from the Colorado Basin. A similar diking project of larger size for Great Salt Lake would create a fresh-water embayment, the waters of which would be used in whole or in part for cooling purposes in a proposed steam-electric power plant. This project should be studied further, in conjunction with several alternative measures that might accomplish similar ends. The quality of available water supplies in the vicinity of Ogden, Utah, may be improved by the construction of sewage-treatment plants.

3. A more important method of increasing the effective supply of water is through salvage of water now wasted or lost by seepage and evaporation from irrigation canals and by its untimely or excessive application to the land. The individual savings from improvements in irrigation practices are small, but in the aggregate they are large. In some basins they may eliminate threatened shortages. Improvements of this type may be attained only through action by individual farmers and by irrigation districts, stimulated by State and Federal agricultural extension workers.

4. The underground waters which accumulate in varying quantities beneath the floors of the intermontane valleys are possible sources of additional supply in most parts of the Great Basin. In many valleys they are the only undeveloped source. They have been used profitably in a few valleys, but their extent, quality, and volume in the remainder of the district are largely


THE GREAT BASIN
SCALE OF MILES
1936
NORTHERN
GREAT
BASIN
OREGON
CALIFORNIA
IDAHO
NEVADA
HUMBOLDT
EASTERN
NEVADA
GREAT SALT LAKE
SIERRA
NEVADA
CENTRAL GREAT BASIN
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NEVADA
CALIFORNIA
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ARIZONA
WYOMING
UTAH
SALT LAKE CITY
Ogden
Great Salt Lake
Pyramid Lake
Reno
Truckee
Lahontan Res.
Humboldt River
Goldfield
Provo
Sevier Lake
Sevier River
Las Vegas
Colorado
Grand Canyon
SACRAMENTO
San Joaquin River
Owens River
Walker River
Snake River
Bear River
Malheur River
Payette River
Point Conception
LOS ANGELES
PACIFIC OCEAN
Salton Sea
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Cities
Drainage Basin Boundary
Water Planning District
Study Project
Basin Wide Study, Water Development for Recreation
Nr
Construction Project
Projects shown include only those ready for immediate construction
District Wide Study of Underground Water for Irrigation and Range Water Supplies.
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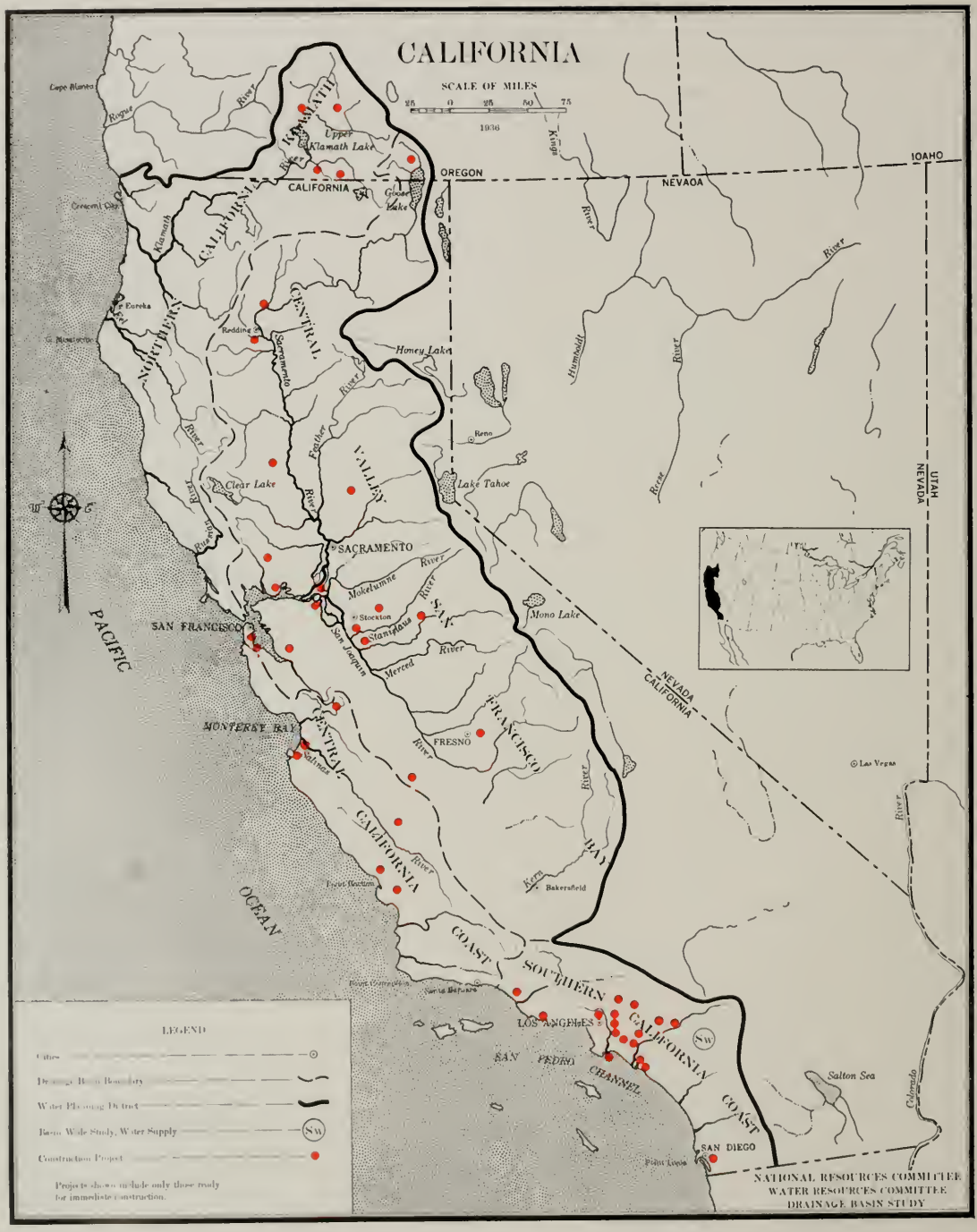
unknown. Surveys are much needed to determine the degree to which underground waters may be drawn upon with confidence for irrigation, stock water supply, and domestic use.

5. Even if all surface waters and all economically available underground waters within the district were utilized effectively, there would still remain a pressing need for more water. This need can be met only by importation from the Colorado Basin. Because of complex legal and economic questions such diversions commonly require special study and long negotiations, but the construction of the Huntington Creek-San Pitch diversion tunnel in Utah may be undertaken immediately. The Green River-Bear River diversion possibilities should be investigated promptly. Action on the Duchesne River-Provo River diversion should await a settlement concerning the participation of Salt Lake City in the Deer Creek project.

The Great Basin Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
General district:		
Irrigation.		
Study to ascertain location and extent of the underground water resources of the Great Basin, especially in those areas not heretofore investigated for use in irrigation.	$200,000	Preliminary plans made.
Study to determine methods for avoidance of losses in distribution and application of irrigation waters	50,000	
Northern Great Basin:		
Irrigation:		
Catlow Valley, Harney County, Oreg.: Study to determine the extent and development of underground water.	9,000	Investigation can be started immediately.
Fort Rock-Christmas Lake Valley: Study to determine extent of underground water in valley and the possible effect its development will have on supplies now utilized on north end of Summer Lake, Lake County, Oreg.	14,000	Do.
Great Salt Lake:		
Irrigation:		
Green River and Bear River, southwest Wyoming and north Utah. Study of diversion from Green River in Colorado Basin to supplement supply for irrigation along Bear River in the Great Basin.	200,000	
Water power:		
Davis County, Utah: Study of project for dams to form embayment in Great Salt Lake and for construction of steam electric power plant.	50,000	Study of alternative methods of obtaining additional water supply and of market for power.
Humboldt:		
Irrigation:		
Study to determine plans for improvement of channels in Little Humboldt River, Nev., and tributaries, including necessary engineering and legal details.	8,000	Preliminary plans complete.
Study to determine the value and feasibility of channel improvements of Humboldt River, Nev., to reduce water losses, including necessary engineering and legal details.	18,000	No plans developed.
Central Great Basin:		
Irrigation:		
Lancaster, Calif. Study of Little Rock Dam, Little Rock Creek, and Palmdale irrigation districts, to devise method of repairs to dam and to determine economics of project and plans of financing.	15,000	No plans have been prepared. Complete engineering, legal, and financial investigations necessary.
Recreation and wildlife:		
Study of water development for recreational facilities throughout the basin	30,000	Preliminary plans made.
2. Construction Projects		
Northern Great Basin:		
Irrigation:		
Lake County, Oreg.: Repairs to dam and reservoir, Silver Lake irrigation district	6,000	Preliminary plans completed.
Lake County, Oreg.: Repairs to dam and canal system, Summer Lake irrigation district	7,000	Do.
Recreation and wildlife:		
Harney County, Oreg.: Dikes for flooding of Malheur migratory water-fowl refuge	117,000	Plans completed.
Great Salt Lake.		
Irrigation:		
San Pete County, Utah: Diversion tunnel to divert Cottonwood Creek from Colorado River Basin to San Pitch River watershed in the Great Basin for irrigation.	30,000	Work under way. Sum indicated needed for completion.
Utah County, Utah: Dike and outlet control to decrease evaporating surface of Utah Lake	800,000	Preliminary study completed. Cost given is for first 2 years. Additional needed to complete $1,574,000.
Weber County, Utah: Pineview Reservoir on Ogden River for irrigation of lands near Ogden, Utah	450,000	Under construction. Sum indicated is needed for completion.
Utah and Wasatch Counties, Utah: Construction of Deer Creek Reservoir and enlargement of Weber-Provo and Provo Reservoir canals.	2,000,000	Under construction. Cost given is for first 2 years. Additional needed to complete, $1,800,000.
Pollution:		
Central Park, Salt Lake City, Utah: Improvements to sewer system	365,000	Plans completed.
Ogden, Utah: Sewage-treatment plant	100,000	Do.
Recreation and wildlife:		
Boxelder County, Utah: Dam and dikes to enlarge Bear River migratory bird refuge	290,000	Preliminary plans completed.
Water supply:		
Bingham, Bountiful, and Manti; Improvements to water-supply system	89,000	Plans completed.
Sierra Nevada:		
Irrigation:		
Nevada County, Calif.: Earth-fill dam in Little Truckee River near Boca for irrigation in Reno Valley and Newlands Project.	250,000	Under construction. Sum indicated is needed for completion.
Recreation and wildlife:		
Churchill County, Nev.: Water-fowl refuge near Fallon	52,000	Preliminary plans prepared. Land acquired.
Central Great Basin:		
Pollution:		
Barstow, Calif.: Sewage-treatment plant	87,000	Plans completed.
GROUP B—FOR DEFERRED CONSTRUCTION		
Great Salt Lake:		
Irrigation and water supply:		
Malad Valley, Idaho: Construction of dams for irrigation, including exploratory work	$170,000	
Utah and Wasatch Counties, Utah: Diversion works to divert Duchesne River from Colorado River Basin to Provo River, in the The Great Basin, for irrigation and water supply.	500,000	Deferred pending decision by Salt Lake City on question of participation in Deer Creek project. Cost given is for first 2 years. Additional needed to complete, $1,600,000.
Water supply:		
Preston, Idaho: Water-supply system	333,000	Plans completed.
Salt Lake City, Utah: Aqueduct from Deer Creek Reservoir, for water supply	500,000	Cost given is for first 2 years. Additional needed to complete, $4,100,000.
Central Great Basin:		
Recreation and wildlife:		
Current, Nev.: Wild-fowl refuge in Railroad Valley	16,000	Plans completed.


CALIFORNIA
SCALE OF MILES
0 25 50 75
1936
OREGON
NEVADA
IDAHO
UTAH
NEVADA
CALIFORNIA
NORTHERN
CENTRAL
SOUTHERN
KLAMATH
Upper Klamath Lake
Klamath River
Rogue River
Cape Blanco
Crescent City
Eureka
Redding
Sacramento River
Feather River
Honey Lake
Reno
Lake Tahoe
Clear Lake
Eel River
Russian River
SACRAMENTO
Mokelumne River
Stockton
San Joaquin River
Merced River
SAN FRANCISCO
MONTEREY BAY
Salinas River
FRESNO
Mono Lake
Humboldt River
Truckee River
Carson River
Walker River
Las Vegas
Colorado River
Bakersfield
Point Reyes
Point Arguello
Santa Barbara
LOS ANGELES
SAN PEDRO
SAN DIEGO
Salton Sea
PACIFIC OCEAN
SAN FRANCISCO BAY
CENTRAL VALLEY
SOUTHERN CALIFORNIA COAST
SAN PEDRO CHANNEL
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Basin Wide Study, Water Supply (SW)
Construction Project
Projects shown include only those ready for immediate construction.
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

CALIFORNIA

The California district, as delimited in this study, comprises all of the State of California except the desert area lying east of the Sierra Nevada, together with a small part of southern Oregon. The outlook for this large area, with its fast-growing population of more than 6,000,000, depends chiefly upon the supply of water that can be made regularly available for essential purposes. In the future, as now, the extent of its agriculture will be limited by the supply of water for irrigation. In the future, even more than now, its industries will depend for power on hydroelectric energy. The future of its cities, no less than that of its farm lands and factories, will be influenced greatly by the supply of water available to them. In comparison with the need for more water, the need for better water through abatement of pollution, the need for additional river improvements in behalf of navigation, the need for further development of water bodies for recreational use, and the like, all are of minor importance. Even the flood problem, though urgent in some localities, is less fundamental than the requirement for more water to replenish or replace underground supplies for irrigation and to provide adequate domestic supplies for the areas of denser urban population.

Realizing years ago that the future of California was tied up with the future of its water supply, the legislature directed the State engineer to conduct a State-wide investigation of water needs and water resources and to formulate a comprehensive plan for water development. The resultant "State Water Plan" was completed in 1931. It involves a long-range projection of the California water problem into the future, and an outline, with some of the detail sketched in, of a program to implement the plan. The investigation upon which the plan is based disclosed the fact that the more serious water shortages of California were in the Los Angeles metropolitan area and the San Joaquin Valley.

To solve the difficulties of the Los Angeles metropolitan area, the plan proposed to divert water from the Colorado River through an aqueduct 249 miles in length. Several years ago the metropolitan water district of southern California was formed to construct this aqueduct at an estimated cost of more than $200,000,000. The great aqueduct is now far advanced toward completion.

To solve in conjunction the difficulties of the San Joaquin Valley and various other water problems of central California, the plan proposed the multiple-purpose Central Valley project. This project is designed to secure the following interlocking benefits: (1) Regulation of the flow of the Sacramento River by means of the Kennett Reservoir, thus assuring Sacramento irrigation projects adequate supplies of water at all seasons. (2) Provision through the Friant Reservoir of an adequate amount of irrigation water for the upper San Joaquin Valley, where a falling water table was depriving a large acreage of fertile and highly developed farm land of its old source of irrigation water. (3) Provision, by pumping surplus water from the Sacramento to the lower San Joaquin Basin, for replacing water distributed in the upper San Joaquin Basin from the Friant Reservoir. (4) Improvement of the navigability of the lower Sacramento and San Joaquin Rivers. (5) Amelioration of flood conditions along both rivers. (6) Control of salinity in the Sacramento-San Joaquin Delta and assurance of an adequate supply of fresh water in the delta area for agricultural, industrial, and domestic purposes. (7) Generation of power in a 260,000-kilowatt installation at the Kennett Reservoir.

The Central Valley project is the outstanding incomplete project of the district, overshadowing all others. It is designed to meet the complex requirements of the great Central Valley, in which 900,000 people live. It has been adopted by the United States Bureau of Reclamation, which is now engaged in detailed engineering studies preparatory to the early initiation of construction. The cost of the project, estimated at about $170,000,000, is to be repaid to the Federal Government by the revenue from sale of power and by the sale of water under the National Reclamation Act. Completion of the project as soon as practicable is of prime importance.

Forest destruction by fire has adversely affected stream flow in parts of California. Forest protection in critical watershed areas is essential.

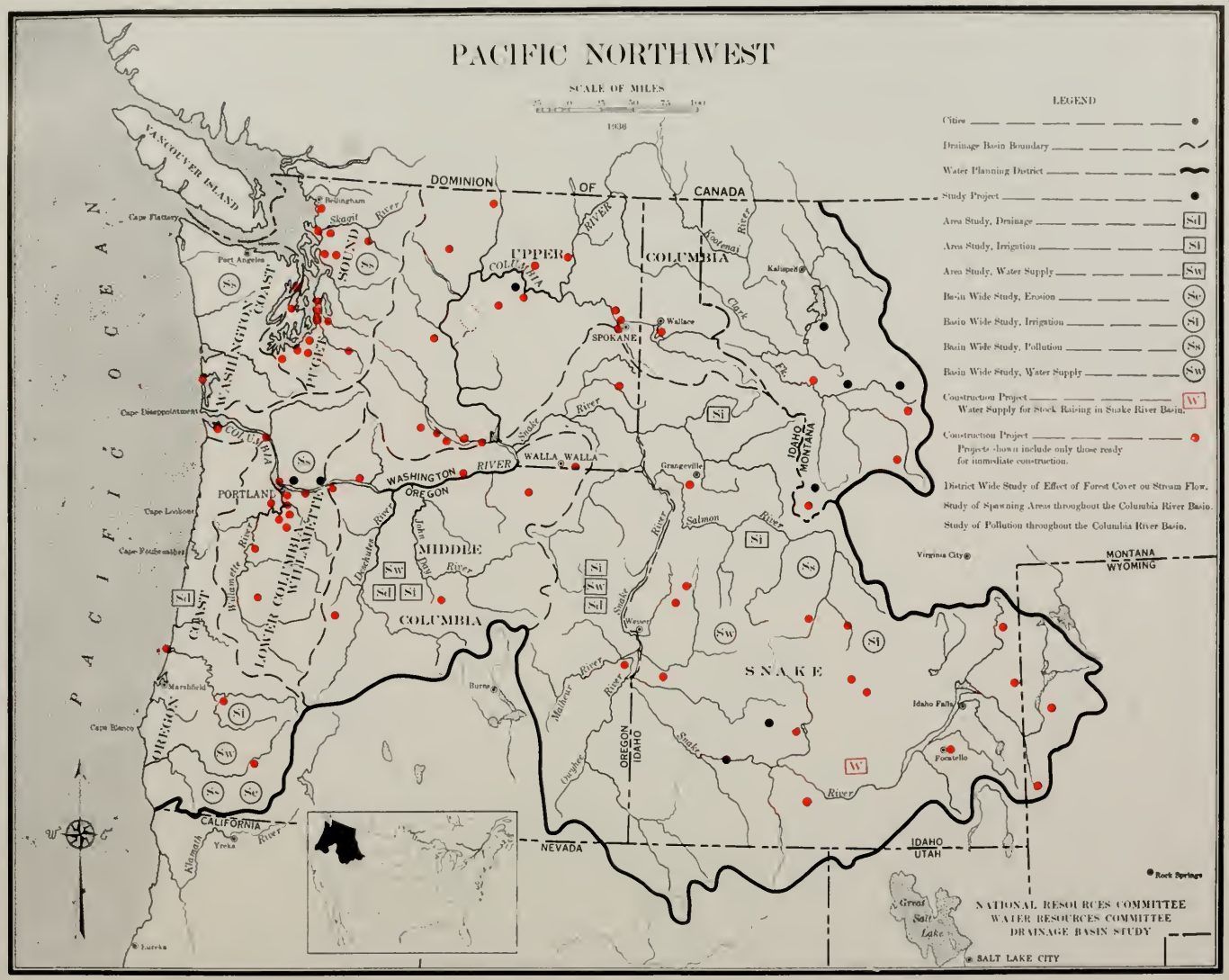
California Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Southern California Coast.		
Irrigation:		
Los Angeles and Orange Counties, Calif.: Study of salt intrusion into wells	$30,000	Preliminary plans made.
2. Construction Projects		
Northern California-Klamath:		
Drainage, flood control, and irrigation:		
Klamath, Oreg.: Construction of Tule Lake division of Klamath Federal Reclamation Project	120,000	Plans completed. Cost given is for first 2 years. Additional needed to complete, $480,000.
Irrigation:		
Klamath Indian Reservation, Oreg.: Irrigation improvements	26,000	Do.
Pollution:		
Klamath Falls and Malin, Oreg.: Extensions to sewer systems	103,000	Do.
Water supply:		
Oregon: Stock water development, conservation of range, utilization of nograzed areas	19,000	Do.
Central Valley-San Francisco Bay:		
Irrigation:		
Goose Lake Valley, Oreg.: Improvement and rehabilitation of irrigation works	92,000	Plans completed.
Stanislaus County, Calif.: Modesto irrigation district service ditch improvement	380,000	Do.
Navigation:		
Santa Clara County, Calif.: Dredging deep sea channel and turning basin in Lower San Francisco Bay and Guadalupe River.	560,000	Authorized by Congress.
Stockton, Calif.: Dredging 9-foot feeder channel	112,000	Sum needed to complete.
Pollution:		
San Francisco, Calif.: Extension and repairs to water, sewer and drainage systems of Letterman General Hospital.	24,000	Plans completed.
Recreation and wildlife:		
Glenn and Colusa Counties, Calif.: Sacramento Valley Bird Refuge; Wild Fowl Concentration Refuge on Sacramento River.	369,000	Sum needed to complete.
Water supply:		
Napa County, Calif.: Supplemental domestic water supply to State institutions in Napa Valley reservoir and pipe line.	1,000,000	Plans completed.
Pittsburg, Calif.: Replacements and extensions to water distribution system	140,000	Do.
Miscellaneous:		
American, Bear and Yuba Rivers, Calif.: 4 debris storage dams to control gravel waste from placer mining.	6,945,000	Authorized by Congress
Central Valley project of California: Comprehensive irrigation, navigation, flood and salinity control, domestic and industrial water supply, and hydroelectric power project covering entire Central Valley.	40,000,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $145,000,000. Construction program will require about 8 years. Authorized by Congress.
Project consists of these engineering features:		
	Estimated cost	
Kennett Dam, reservoir and power plants	$84,000,000	
Kennett transmission line and substation	14,000,000	
Contra Costa conduit	2,500,000	
San Joaquin pumping system	18,500,000	
Friant Dam and Reservoir	14,000,000	
Friant-Kern Canal	26,000,000	
Madera Canal	3,000,000	
Rights of way, water rights and general expense	8,000,000	
Central California Coast:		
Irrigation:		
Santa Clara and San Benito Counties, Calif.: Supplemental water supply involving construction of 3 reservoirs and 4 canals for irrigation and recharge of underground basins in Pacheco water district.	335,000	Plans completed.
Pollution:		
Carmel sanitary district, Calif.: Complete sewage treatment	50,000	Do.
San Luis Obispo, Calif.: Partial sewage treatment	24,000	Do.
Water supply:		
San Luis Obispo, Calif.: Supplemental water supply involving intra-basin diversion, collection reservoir, tunnel and pipeline, regulating reservoir, and mains.	980,000	Do.
Miscellaneous:		
Basin-wide project to protect forest and brush cover against fire, with attendant benefits to grazing, soil erosion, and flood control.	[1] 226,000	Plans have been prepared by Forest Service for a continuous construction and maintenance program.
Southern California Coast:		
Flood control:		
Los Angeles County, Calif.: Flood control and water conservation on Los Angeles and San Gabriel Rivers by Los Angeles County flood control district.	35,000,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $37,000,000. Authorized by Congress.
Navigation:		
Los Angeles and Long Beach Harbors, Calif.: Breakwater	1,375,000	Sum needed to complete immediate project. Authorized by Congress.
Pollution:		
Azusa, Calif.: Sewers and complete sewage treatment	180,000	Plans completed.
Laguna Beach, Calif.: Sewers and complete sewage treatment	190,000	Do.
Monterey Park, Calif.: Sewers and complete sewage treatment	200,000	Do.
Newport Beach, Calif.: Sewers, outfall and complete sewage-treatment	230,000	Do.
San Diego, Calif.: Sanitary sewer system and sewage treatment plant	2,000,000	Do.
San Gabriel, Calif.: Sewer system and sewage treatment plant	450,000	Do.
Water supply:		
Bell, Calif.: Extension and improvement of water-supply system	314,000	Do.
Rosemead, Calif.: Waterworks	242,000	Do.
Ventura, Calif.: Reservoir on Coyote Creek for supplemental water supply	844,000	Do.
Miscellaneous:		
Basin-wide project to protect forest and brush cover against fire, with attendant benefits to grazing, soil erosion and flood control.	[1] 393,000	Plans have been prepared by Forest Service for a continuous construction and maintenance program.

[1] Annually.

California Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION		
Northern California-Klamath:		
Flood control:		
Eel River, Calif.: Retards, bank protection, and levees	$144,000	Authorized by Congress. Construction set for 1939. Plans in preparation.
Irrigation:		
Beaver Creek, Oreg.: Dam for irrigation		See Pacific Northwest (Oregon-Pacific basin) project list for cost.
Pollution:		
Healdsburg, Calif.: Outfall sewer and partial sewage treatment plant	15,000	Preliminary plans completed.
Recreation and wildlife:		
Lower Klamath Lake, Oreg.: Bird refuge	1,500,000	Do.
Water supply:		
Merrill, Oreg.: Improvement to water supply system	30,000	Plans incomplete.
Yreka, Calif.: Improvement to water supply system	235,000	
Central Valley-San Francisco Bay:		
Flood control, irrigation, and water power:		
Sacramento County, Calif.: Folsom Reservoir in American River	4,000,000	Preliminary plans completed. Cost given is for first 2 years. Additional needed to complete, $8,000,000.
Irrigation:		
Butte County, Calif.: Supplemental water and improvements for Paradise irrigation district	300,000	Plans completed.
El Dorado County, Calif.: supplemental water and improvements for El Dorado irrigation district	360,000	Do.
Fresno County, Calif.: Pine Flat Reservoir to control seasonal peak flows of the Kings River for supplemental water supply.	3,000,000	Preliminary plans completed. Cost given is for first 2 years. Additional needed to complete, $7,000,000.
Modoc and Lassen Counties, Calif.: Supplemental water for Big Valley irrigation project	325,000	Plans under way.
Navigation:		
San Francisco Harbor: Remove 3 rock shoals	45,000	Survey completed.
Solano County, Calif.: Dredging and straightening Suisun Channel to 8-foot depth from Suisun Bay to town of Suisun.	140,000	Do.
Pollution:		
Bakersfield, Calif.: Partial sewage treatment	100,000	Preliminary plans completed.
North Sacramento, Calif.: Complete sewage treatment	20,000	Do.
Palo Alto, Calif.: Sewage disposal plant for veterans' hospital	32,000	Survey in progress.
Petaluma, Calif.: Outfall sewer and complete sewage treatment	316,000	Preliminary plans completed.
Placerville, Calif.: Outfall sewer and partial sewage treatment	50,000	Do.
Willows, Calif.: Partial sewage treatment	10,000	Do.
Miscellaneous:		
Nevada County, Calif.: Water for hydraulic mining, Black Rock placer mining district	249,000	Plans under way.
Central California Coast:		
Flood control and irrigation:		
Santa Barbara and San Luis Obispo Counties, Calif.: Irrigation and flood control in Santa Maria Valley; dam and reservoir on Cuyama River and main canals.	1,500,000	Preliminary engineering work completed. Cost given is for first 2 years. Additional needed to complete, $2,500,000.
Irrigation:		
Monterey County, Calif.: Storage on the Salinas River system for irrigation, recharging of underground water supplies, and power.	1,000,000	Plans incomplete. Cost given is for first 2 years. Additional needed to complete, $1,700,000.
San Benito County, Calif.: Supplemental water supply for Hollister irrigation district, involving construction of 3 dams, 2 canals, and spreading grounds for underground percolation; the Pacheco project covers part of this plan.	500,000	Plans incomplete. Cost given is for first 2 years. Additional needed to complete, $800,000.
Pollution:		
King City, Calif.: Outfall sewer and partial sewage treatment	20,000	Preliminary plans completed.
Pacific Grove, and Santa Maria, Calif.: Sewer systems	50,000	Plans incomplete.
Southern California Coast:		
Drainage:		
Oxnard, Calif.: Drainage district no. 3. Drainage to remove alkaline salts	318,000	Preliminary plans completed.
Flood control:		
Orange County, Calif.: Flood control and water conservation	16,500,000	Authorized by Congress.
Irrigation:		
San Diego County, Calif.: Fallbrook irrigation district, water supply from San Luis Rey River for irrigation of 5,000 acres.	250,000	Preliminary plans completed. Cost given is for first 2 years. Additional needed to complete, $336,000.
Ventura County, Calif.: Conservation of waste water of Santa Clara River for irrigation and recharging underground basin.	1,000,000	Investigation under way. Cost given is for first 2 years. Additional needed to complete, $2,200,000.
Navigation:		
San Diego Harbor, Calif.: Dredging	4,184,000	Survey completed.
Pollution:		
Arcadia, Calif.: Sewer system and sewage treatment plant	271,000	Plans completed.
San Diego, Calif.: Outfall sewer and 2 sewage treatment plants	500,000	Preliminary plans completed.
San Jacinto, Calif.: Sewers and partial sewage treatment	20,000	Do.
Sunset Beach sanitary district, Calif.: Sewers and partial sewage treatment	60,000	Do.


PACIFIC NORTHWEST
SCALE OF MILES
1936
LEGEND
Cities
Drainage Basin Boundary
Water Planning District
Study Project
Area Study, Drainage
Area Study, Irrigation
Area Study, Water Supply
Basin Wide Study, Erosion
Basin Wide Study, Irrigation
Basin Wide Study, Pollution
Basin Wide Study, Water Supply
Construction Project
Water Supply for Stock Raising in Snake River Basin.
Construction Project
Projects shown include only those ready for immediate construction.
District Wide Study of Effect of Forest Cover on Stream Flow.
Study of Spawning Areas throughout the Columbia River Basin.
Study of Pollution throughout the Columbia River Basin.
PACIFIC OCEAN
VANCOUVER ISLAND
DOMINION OF CANADA
Bellingham
Skagit River
PUGET SOUND
WASHINGTON COAST
Cape Flattery
Port Angeles
Cape Disappointment
COLUMBIA RIVER
UPPER COLUMBIA
Kootenai River
Kalispell
Clark Fk.
Wallace
SPOKANE
Snake River
WALLA WALLA
Grangeville
IDAHO
MONTANA
WASHINGTON
OREGON
PORTLAND
Cape Lookout
Cape Foulweather
Willamette River
LOWER COLUMBIA-WILLAMETTE
John Day River
Deschutes River
MIDDLE COLUMBIA
Salmon River
Virginia City
MONTANA
WYOMING
COAST
Marshfield
Cape Blanco
OREGON
Burns
Malheur River
Owyhee River
OREGON
IDAHO
SNAKE
Weiser
Idaho Falls
Pocatello
CALIFORNIA
Klamath River
Yreka
NEVADA
IDAHO
UTAH
Rock Springs
Great Salt Lake
Eureka
SALT LAKE CITY
NATIONAL RESOURCES COMMITTEE
WATER RESOURCES COMMITTEE
DRAINAGE BASIN STUDY

PACIFIC NORTHWEST

The Pacific northwest district comprises all drainage areas of the United States tributary to the Pacific Ocean north of Smith River near the California-Oregon line. The regional water problems of the district are differentiated by natural and cultural conditions. West of the Cascades, precipitation is heavy on the mountain slopes and adequate for various crops on the lowlands, irrigation is chiefly supplemental in type, floods are frequent along many streams, navigation is important and tied intimately to ocean shipping, and the population of the lowlands is relatively dense. East of the Cascades, precipitation in most places is very light, irrigation is indispensable to successful agriculture in many localities, floods are less frequent, navigation is unimportant, and the population of most of the area is sparse. Both west and east of the mountains, natural conditions are favorable for the development of large amounts of water power.

The most pressing problem at present in relation to power is the development, through stimulation of power-consuming industries and otherwise, of markets for the output of projects now under construction, particularly those at Grand Coulee and Bonneville. The proposal to add greatly to the height of the dam under construction at Grand Coulee is intended not only to increase the output of power, but also to promote irrigation and in so doing create a market for power. Some of the power made available by the higher dam could be used to pump water to irrigate ultimately 1,200,000 acres of fertile land above the proposed reservoir and otherwise to serve settlers on the land reclaimed. The long-term relationships of the High Dam should receive further study.

The dams at Grand Coulee and Bonneville are the uppermost and lowermost members of a system of 10 dams by which it is proposed to utilize ultimately 92 percent of the 1,300-foot fall of the Columbia River in its 750-mile course from the Canadian border to the sea for power plants with an aggregate installed capacity of more than 10,000,000 horsepower. The objective challenges admiration, but construction of additional units of the system should not get out of step with the regional requirements for power. The system of dams proposed would provide, with associated channel improvements, for seagoing ships to The Dalles, 190 miles inland, and for modern barges to Priest Rapids, 400 miles inland. Decades undoubtedly will pass before the development of the Columbia River for power, irrigation, and navigation is completed.

Some irrigation projects now in operation east of the Cascades suffer at times from serious shortages of water. This is particularly true in southern Idaho, where there is much need for supplemental supplies. A comprehensive investigation is recommended to determine all practicable sources from which the water that is needed may be obtained.

Some 24 short streams west of the Cascades are subject to floods that cause damages averaging approximately $1,000,000 annually to lowland property. Flood control, involving erosion control, is the outstanding water need of the Puget Sound area. Large amounts of cheap hydroelectric power are being developed, particularly by Seattle on the Skagit River. It is important that the coastal power programs be harmonized with those at Grand Coulee and Bonneville in the interest of economical marketing.

The Corps of Engineers is conducting a comprehensive investigation of the entire Willamette drainage in Oregon. It is expected that the resulting program will provide for several large upstream reservoirs that will afford much-needed flood protection, improve the navigability of the Willamette to Eugene, improve the quality of river water by dilution, and develop incidental hydroelectric power. Sewage and industrial treatment plants at Portland and other communities should not, however, await completion of the integrated plan. Drainage of about three-quarters of a million acres in the valley by progressive step development also is desirable.

Pacific Northwest Project List

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION		
1. Investigation Projects		
Columbia River (genoral problems):		
Irrigation:		
Big Blackfoot Valley: Reconnaissance survey for irrigation	$10,000	
Bitterroot Valley: Reconnaissance survey of water supply for irrigation	20,000	
Camas Prairie. Reconnaissance survey of water supply for irrigation	50,000	
Irrigation and drainage surveys other than Columbia Basin projects	100,000	
Missoula Valley: Reconnaissance survey of water supply for irrigation	50,000	
Upper Flathead Basin: Reconnaissance survey of water supply for irrigation	30,000	
Pollution:		
Stream-pollution studies throughout basin	120,000	
Recreation and wildlife:		
Fishery survey of streams and spawning areas throughout basin	50,000	
Water supply:		
Oregon: Municipal water supply investigation	16,000	
Miscellaneous:		
Forest cover—Stream flow studies	475,000	
Oregon: Irrigability classification of project lands	50,000	
Washington: Preliminary surveys of likely demonstration areas for soil and water conservation	4,000	
Washington and Idaho: Silt load measurements	53,000	
Snake:		
Irrigation:		
Clearwater River Basin in Idaho: Study and surveys to determine the irrigation possibilities	30,000	
Salmon River and tributaries in Idaho: Study and survey to determine the irrigation possibilities	50,000	Necessary for construction of project under Group B.
Snake River Basin in Oregon: Study and surveys of the irrigation and drainage conditions	100,000	
Snake River Basin in Oregon: Classification of project lands for irrigation	15,000	
Pollution:		
Snake River Basin: Study of stream pollution	59,000	
Recreation and wildlife:		
Snake River Basin: Fishery survey of streams and spawning areas throughout basin	11,000	
Water supply:		
Snake River Basin in Oregon: Study of municipal water supply	4,000	
Study of water supply and storage including trans-mountain diversions	300,000	Continuation of present studies.
Miscellaneous:		
Snake River Basin: River-utilization surveys	15,000	
Snake River Basin: Study of the data obtained by a geological and geophysical survey	185,000	Plans completed by U. S. Geological Survey
Upper Columbia:		
Irrigation:		
Columbia Basin project, Washington: Classification of irrigable lands for best use of water made available by Grand Coulee Dam.	500,000	Sum needed to complete.
Flathead County, Mont.: Investigation of Hungry Horse Reservoir project	150,000	
Lower Columbia-Willamette:		
Pollution:		
Stream-pollution study	50,000	
Recreation and wildlife:		
Fishery survey of streams and spawning areas throughout basin	17,000	
Puget Sound:		
Pollution:		
Stream-pollution study. Public health and protection to fish life	120,000	
Recreation and wildlife:		
Fishery survey of streams and spawning areas throughout basin	50,000	
Miscellaneous:		
Aero mapping of river channels and their drainage areas	30,000	
River utilization surveys: To obtain river and reservoir topography	43,000	
Oregon coast.		
Drainage:		
Oregon. Study of diking and drainage for reclamation of marsh lands along coast	30,000	Plans not made.
Irrigation:		
Classification of irrigable lands: To determine best lands and cull out inferior lands	13,000	No plans; begin immediately
Surveys to determine best means of irrigating 55,500 acres	25,000	Do.
Pollution:		
Stream-pollution surveys	10,000	
Recreation and wildlife:		
Fishery survey of streams and spawning areas throughout basin	30,000	
Water supply:		
Municipal water-supply investigations: Improve domestic water supply and sewage works	8,000	
Miscellaneous:		
River-utilization surveys: To obtain river and reservoir topography	20,000	
Silt-gazing stations. To determine quantities of soil actually eroded	169,000	
Washington coast:		
Pollution:		
Stream-pollution studies	24,000	Plans completed
Recreation and wildlife:		
Fishery survey of streams and spawning areas throughout basin	25,000	Begin immediately.
Miscellaneous:		
River-utilization surveys: To obtain river and reservoir topography	15,000	Plans completed.
2. Construction Projects		
Columbia River.		
Drainage:		
Levee improvements, with drainage at some points to reclaim land subject to overflow of Columbia River or its backwaters from Bonneville to the sea at 4 districts near Portland, at districts 1, 3, 4, and Skamokawa, Upper Grays and Bay Rivers in Wahkiakum County at Deer Island, Prescott, Westland, and Sauvie Island and along Cowlitz, Longview, Wallicut, and Lewis Rivers in Washington and Oregon.	5,521,000	Sum needed to complete. Sketch plans completed and detailed plans in preparation for some projects.
Irrigation and power:		
Grand Coulee Dam, Columbia Basin project, west of Spokane, Wash. High dam for irrigation storage reservoir and power plant.	40,000,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $84,250,000. Total cost $180,000,000. Construction will cover a period of years.
Navigation:		
Columbia River, Oreg. and Wash.: Navigation channel from Celile to Umatilla	287,000	Cost given is for next 2 years. Additional needed to complete, $450,000. Surveys completed. Authorized by Congress.
St. Helens Channel. Dredge 30-foot channel, Columbia River to St. Helens	50,000	Surveys completed. Authorized by Congress.
Youngs Bay and River, Oreg.: Dredge 10-foot channel, Columbia River to Havens Island	5,000	Surveys completed.
Navigation and power:		
Bonneville Dam, Columbia River, Oreg. and Wash.: Navigation and power dam	5,650,000	Work in progress. Amount shown needed for completion of dam and initial appurtenances. Total cost is $45,065,700.

Pacific Northwest Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Columbia River—Continued.		
Water supply:		
Idaho, Oregon, and Washington: Reservoirs, springs, and wells on the public range and national forest, for watering stock.	$222,000	Can be started at once. Needed to arrest decline of herds and spotted overgrazing.
Snake:		
Irrigation:		
Arco, Idaho: Diversion dam on Big Lost River	55,000	Sketch plans completed.
Ashton, Idaho: Squirrel Meadows storage reservoir for irrigation in Idaho	200,000	
Custer County, Salmon River Drainage, Idaho: Challis irrigation canal improvements	44,000	Survey not completed.
Driggs, Teton County, Idaho: Storage on Teton River for irrigation	1,050,000	Investigations completed.
Emmett, Idaho: Diversion canal for Black Canyon irrigation district	2,500,000	Under construction. Cost given is for next 2 years. Additional needed to complete, $1,300,000.
Fort Hall, Idaho: Indian reservation irrigation project	150,000	Preliminary plans in progress. Cost given is for first 2 years. Additional needed to complete, $235,000.
Indian Valley, Weisen River Drainage, Idaho: Reservoir for irrigation	128,000	Sketch plans completed.
Jackson, Wyo.: Irrigation system for elk refuge	49,000	Preliminary plans completed.
Lincoln County, Wyo.: Star Valley Reservoir for supplemental storage for irrigation	57,000	Plans completed.
Malheur County, Oreg.: Owyhee irrigation project	800,000	Under construction. Cost given is for next 2 years. Additional needed to complete main canals and laterals, $300,000.
Pollution:		
Boise, Idaho: Sewage treatment plant	273,000	Sketch plans completed.
Colfax, Wash.: Sewage treatment plant	97,000	Plans completed.
Grangeville, Idaho: Sewage treatment plant	11,000	Preliminary plans completed.
Lostine, Oreg.: Sewage treatment plant	11,000	Do.
McCall, Idaho: Sewer system	32,000	Sketch plans completed.
Water supply:		
New Plymouth, Idaho: Water supply system	40,000	Plans completed.
Snake River Basin, Idaho: Development of supplemental water supply by well drilling, for stock raising in Taylor grazing districts.	113,000	General plans completed.
Snake River Basin, Idaho, Oregon, and Washington: Development of water supply for stock raising	258,000	Do.
Twin Falls, Idaho: Storage for water supply	144,000	Sketch plans completed.
Upper Columbia:		
Drainage:		
Latah Creek, near Spokane, Wash.: Drainage improvements to prevent stagnant pools	81,000	Plans completed.
Yakima near Tonpenish, Wash.: Improvements to drainage system	87,000	Do.
Irrigation:		
Flathead irrigation project, Lake Sanders, Missoula, Mont.: Complete Indian reservation irrigation project, pumping, storage, and drainage.	1,000,000	Detail plans in preparation. Cost given is for first 2 years. Additional needed to complete, $1,096,000.
Inchelium City, Wash.: Diversion dam for storage in Twin Lakes to irrigate Indian lands	35,000	Under construction.
Nespelem River, Nespelem, Wash.: Complete diversion and dam for irrigation storage in Owhi Lake.	24,000	Sum needed to complete. Total cost $216,000.
Nevada Creek, Powell County, Mont.: Irrigation dam and reservoir for supplemental water	248,000	
Race Track Creek, Powell County, Mont.: Irrigation dam and reservoir for supplemental water	254,000	
Wapato, Wash.: Complete irrigation project	350,000	Preliminary plans made. Cost given is for first 2 years. Additional needed to complete, $750,000.
West Fort Bitterroot, Ravalli County, Mont.: Irrigation dam and reservoir for supplemental water	450,000	
Wheeler Dam, near Wenatchee, Wash.: Raise dam to increase irrigation storage	21,000	Plans completed.
Irrigation and power:		
Roza project, near Yakima, Wash.: Irrigation canal and power plant	11,500,000	Sum needed to complete. Total cost $15,000,000.
Pollution:		
Coeur d'Alene City, Idaho: Improve existing sewer system	69,000	
Spokane, Wash.: Additions to sewer system and sewage treatment plant	909,000	Plans completed.
Wapato City, Wash.: Sewage treatment plant	22,000	Do.
Recreation and wildlife:		
Fish screens and ladders on existing Federal irrigation projects throughout basin	345,000	
Water supply:		
Kennewick, Wash.: Improvements and extensions to water system	31,000	Do.
Spokane, Wash.: Install 1,800 horsepower pumping plant for city supply	330,000	Do.
Twisp, Wash.: Water system	36,000	Do.
Whitestone City, Wash.: Water system, including repairs to irrigation system	37,000	Do.
Middle Columbia:		
Flood control:		
Pendleton, Oreg.: Flood channel improvements in Umatilla River	200,000	Detail plans in preparation.
Irrigation:		
Warm Springs Indian Reservation, near Mitchell, Wheeler County, and near Bend and Sisters, Deschutes County, Oreg.: Irrigation and stock watering dams.	78,000	Surveys completed only for Warm Springs Indian Reservation.
Pollution and water supply:		
Dayton, Wash.: Sewer system and sewage treatment plant	50,000	
Water supply:		
Dayton, Wash.: Improvements to water system	35,000	Plans completed.
White Salmon, Wash.: Reconstruct water system	90,000	Do.
Lower Columbia-Willamette:		
Flood control:		
Willamette River Basin: Bank protection and clearing flood channels on Willamette River and tributaries.	2,430,000	Detailed plans in preparation authorized by Congress.
Pollution:		
Beaverton, Oreg.: Outfall sewer and sewage treatment plant	79,000	Preliminary plans made.
Gladsone, Oreg.: Intercepting sewer and sewage treatment plant	35,000	Do.
Milwaukee, Molalla, Oregon City, and West Linn, Oreg.: Sewer system extensions and sewage treatment plants.	450,000	
Oregon City, Oreg.: Intercepting sewer and sewage treatment plant	106,000	Do.
Portland, Oreg.: Sewage treatment plants and interceptor sewers to improve Willamette River	9,575,000	Only preliminary plans made
Salem, Oreg.: Interceptiog sewer and primary sewage treatment plant	360,000	Preliminary plans made.
Puget Sound:		
Flood control:		
Mud Mountain Reservoir on White River for flood control of White and Puyallup River	3,205,000	Detailed plans in preparation. Includes estimated cost of land.
Skagit River, cut-off channel	4,798,000	Do.
Tacoma, Wash.: Channel improvement of Puyallup River	1,555,000	Do.
Flood control and erosion:		
Stillaguamish River channel for flood and erosion control	261,000	Detailed plans in preparation.
Flood control and navigation:		
Seattle Harbor: Settling basin for flood relief and navigation	10,000	Surveys completed.
Navigation:		
Olympia Harbor: Widen entrance channel	98,000	Do.
Tacoma Harbor, Hylebos Waterway: Dredging turning basin and channel	112,000	Do.

Pacific Northwest Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP A—FOR IMMEDIATE INVESTIGATION OR CONSTRUCTION—Continued		
2. Construction Projects—Continued		
Puget Sound—Continued.		
Pollution:		
Bellingham, Wash.: New outfall sewer and sewer system additions	$103,000	Plans completed.
Bremerton, Wash.: Extension of sewer system	174,000	Do.
Seattle, Wash.: Oregon and Henderson Street sewer system and sewage treatment plant	500,000	Do.
Tacoma, Wash.: Trunk sewers and sewage treatment plant	631,000	Do.
Water supply:		
King County, water district, 49: Domestic waterworks system	126,000	Do.
Oregon Coast:		
Irrigation:		
Medford, Oreg.: Diversion dam for Rogue River Valley	25,000	Right of way acquired; no plans made.
Talent City, Oreg.: Line irrigation water tunnel	10,000	No plans required.
Navigation:		
Reedsport, Oreg.: Extension of south jetty, Umpqua River	600,000	Authorized by Congress. Survey and plans completed.
Pollution:		
Roseburg, Oreg.: Sewer system and sewage treatment	86,000	Plans completed.
Washington Coast:		
Navigation:		
Grays Harbor, Wash.: Reconstruction of harbor entrance jetties	3,155,000	Work under way. Sum needed to complete.
Port Gamble, Wash.: Deepen entrance to bay	20,000	Surveys completed.
GROUP B—FOR DEFERRED CONSTRUCTION		
Columbia River:		
Navigation:		
Columbia River: Dredge 27-foot channel Vancouver to Bonneville	$2,380,000	Survey completed.
Elokomin Slough: Dredge 10-foot channel to Columbia River for navigation	16,000	Do.
Vancouver, Wash.: Extension of lower turning basin	22,000	Do.
Snake River:		
Drainage:		
Caldwell, Idaho: Drainage system in drainage district no. 6	131,000	Sketch plans completed.
Irrigation:		
Boise County, Idaho: Jerusalem Valley Dam and reservoir on Porter Creek	35,000	Preliminary plans completed.
Butte County, Idaho: Bypass irrigation canal on Big Lost River	96,000	
Council, Idaho: Lost Valley Dam and storage reservoir	20,000	
Elgin, Oreg.: Diversion dam	18,000	
Gooding County, Idaho: Irrigation storage reservoir on Clover Creek	66,000	
Lenore, Salmon River Drainage, Idaho: Texas Creek dam for irrigation	189,000	Sketch plans completed.
Lincoln County, Idaho: Bypass canal on Big Wood River	30,000	No plans.
Lewiston, Idaho: Replacements to existing irrigation system	160,000	Detail plans in preparation.
Picabo, Idaho: Irrigation storage reservoir on Silver Creek	206,000	Sketch plans completed
Roseberry, Idaho: Additional irrigation storage in Boulder Lake reservoir	24,000	Preliminary plans completed
Rupert, Idaho: Diversion canal to the Salmon tract	61,000	Do.
Teton County, Wyo.: Upper Slide Lake reservoir for Teton irrigation project	10,000	Do.
Valley County, Idaho: Irrigation storage in Upper Payette Lake	186,000	Do.
Valley County, Idaho: Clear Creek Dam and storage reservoir	25,000	Do.
Washington County, Idaho: Dam and irrigation canal on Lower Manns Creek	100,000	Do.
Washington County, Idaho: Irrigation storage reservoir on Upper Manns Creek	101,000	Do.
Irrigation and power:		
Baker, Oreg.: Storage reservoir on Powder River for irrigation and power	3,605,000	Preliminary surveys completed.
Recreation and wildlife:		
Idaho, Oregon, Washington, and Wyoming: Fish screens and ladders for Snake River Basin at Federal projects for protection of fish life.	355,000	
Water supply:		
La Grande, Oreg.: Improvements to water supply system	194,000	Preliminary plans completed.
Ontario, Oreg.: Improvements to water supply system	94,000	Do.
Teton, Idaho: Replacements to existing water supply system	48,000	Sketch plans completed.
Upper Columbia:		
Irrigation:		
Columbia Basin project: Irrigation works	1,000,000	Construction may require 50 years. Cost given is for first 2 years. Additional needed to complete, $196,000,000.
Kootenai Creek project, Ravalli County, Mont.: Irrigation storage dams	36,000	
Post Falls, Idaho: Improvement to irrigation system, pumps, and canals	160,000	Sketch plans completed.
Swamp Creek, Sanders County, Mont.: Irrigation storage dam for supplemental water	60,000	
Valley Lake project, Flathead County, Mont.: Irrigation dam, canal, and tunnel	600,000	
Irrigation and water supply:		
Rattlesnake Creek near Missoula, Mont.: Irrigation storage dams, and city water supply	22,000	
Pollution:		
Ellensburg, Wash.: Sewage treatment plant	80,000	
Prosser, Wash.: Sewage treatment plant	20,000	
Toppenish, Wash.: Sewage treatment plant	30,000	
Water supply:		
Kennewick, Wash.: Water purification plant	30,000	
Pasco, Wash.: Water purification plant	40,000	
Sandpoint, Idaho: Improvements to city water system	88,000	Do.
Middle Columbia:		
Flood control:		
Mill Creek near Walla Walla, Wash.: Construction flood control works, including storage and flood channel improvements	1,794,000	Detail plans completed.
Touchet River, near Dayton, Wash.: Channel improvements	22,000	Plans completed.
Irrigation:		
Madras, Oreg.: Canal and dam for irrigation of Deschutes north district	3,000,000	Surveys completed. Cost given is for first 2 years. Additional needed to complete, $5,000,000.
Prineville, Oreg.: Improvements to existing Ochoco irrigation system	85,000	Surveys completed.
Warm Springs Indian Reservation: Addition to irrigation works	50,000	Surveys completed. Cost given is for first 2 years Additional needed to complete, $215,000.
Recreation and wildlife		
Oregon and Washington: Fish ladders and screens at dams and irrigation ditches to prevent destruction of fish life at Federal projects on tributaries in middle Columbia Basin.	125,000	Estimate is approximate. Survey needed to supply accurate information as to location and cost.
Water supply:		
The Dalles, Oreg.: City water system	551,000	Preliminary plans completed.
Lower Columbia-Willamette:		
Water supply:		
Maplewood water district, Multnomah County, Oreg.: Reconstruction of waterworks system	22,000	Do.

Pacific Northwest Project List—Continued

Drainage basin and project description	Estimated cost	Remarks
GROUP B—FOR DEFERRED CONSTRUCTION—Continued		
Puget Sound:		
Flood control:		
Black River: Channel improvement	$23,000	
Hatt Slough: Reconstruction and repair of dikes	26,000	Plans completed.
Sauk River Channel: Revetments	53,000	Do.
Flood control and drainage:		
Skagit County drainage district no. 17: Flood control and drainage	107,000	Do.
Water supply:		
Alderwood Manor, Wash.: Extension of water distribution system	102,000	Do.
Oregon coast:		
Irrigation:		
Beaver Creek, Oreg.: Dam for irrigation	425,000	Preliminary plans completed.
Jackson County, Oreg.: Line Eastside Canal, Talent irrigation district, and main canal	125,000	
Pollution:		
Jacksonville, Oreg.: Sewer system	24,000	
Water supply:		
Bay City, Oreg.: Water supply system	40,000	
Coquille, Oreg.: Water mains	35,000	
Fort Orford, Oreg.: Water supply system	26,000	
Toledo, Oreg.: Water supply system	130,000	
Washington coast:		
Water supply:		
Centralia, Wash.: Pumps for domestic water supply system	176,000	Plans completed.
Willapa Valley, Wash.: Diversion dam on Stringer Creek and water main extension	69,000	

METHOD OF STUDY

A large portion of the work in the field was carried out through the State planning organizations working in conjunction with field officers of interested Federal and State agencies. In many States, the State planning boards appointed special committees on water resources. State planning consultants, State engineers, State health officers, State geologists, municipal engineers, and numerous other officials participated in organizing basic materials for the use of the Regional Water Consultants.

The following Federal agencies participated in the study:

Bureau of Agricultural Engineering
Bureau of Biological Survey
Bureau of Fisheries
Bureau of Mines
Bureau of Reclamation
Corps of Engineers
Division of Grazing
Federal Emergency Administration of Public Works
Federal Power Commission
Forest Service
International Boundary Commission, American Section
International Joint Commission
National Park Service
Office of Indian Affairs
Soil Conservation Service
Tennessee Valley Authority
United States Geological Survey
United States Public Health Service
Works Progress Administration

All of these supplied data for the preparation of the consultants' reports. Many of them contributed generously in technical assistance in the review of consultants' reports. The Water Resources Committee is indebted especially to the Bureau of Reclamation for assistance furnished by the Denver office of the Bureau; to the Public Health Service for loan of personnel from the Office of Stream Pollution Investigations at Cincinnati; to the Public Works Administration for technical assistance in the Washington office; and to the Corps of Engineers for personnel detailed from the office of the Mississippi River Commission at Vicksburg.

The subcommittee of the Water Resources Committee which reviewed the individual basin reports was assisted by O. L. Hooper of the Federal Power Commission, C. S. Jarvis of the Soil Conservation Service, and Capts. Thomas Stanley and William W. Wanamaker of the Corps of Engineers, each of whom represented committee members at various times.

The study was handled as part of the National Resources Committee administration under Charles W. Eliot 2d, executive officer, and Harold Merrill, assistant executive officer. Cooperation of State planning boards and their staffs, financed from the National Resources Committee and from State and Works Progress Administration project funds, was organized under the direction of Robert H. Randall, consultant on State planning. The facilities of the Information and Publication Division, under Lloyd George, editor, and Martin E. Jansson, his assistant, were utilized. Charles P. Dake was in charge of administrative arrangements, Charles Faunce supervised the drafting, and Ethel F. Fealy supervised the stenographic work. The special arrangements for temporary personnel and office space were facilitated through the cooperation of the Office of the Secretary of the Interior. The U. S. Geological Survey aided in the drafting of maps.

Clerical and stenographic assistance for the regional water consultants was contributed in part through State planning board projects financed through the Works Progress Administration.

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PART III
DIVISION OF COSTS AND RESPONSIBILITY

The following reports are submitted as supporting data, but the National Resources Committee assumes no responsibility for the views and opinions of the authors.

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DIVISION OF COSTS OF PUBLIC WORKS

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PART III—FOREWORD

This part of the report deals with the division of costs and responsibility for different types of public works among the Federal, State, local, and private interests concerned with these projects. An earlier report of the National Resources Board [1] recommended authorization by Congress for an administrative agency "to negotiate and approve agreements with local, State, and regional authorities within limits prescribed by Congress and approved by the President" for division of costs. The President's Committee on Waterflow [2] had stressed the need for agreement upon a "statement of principles to govern the division of responsibility and costs as among Federal, State, municipal, and private bodies for various kinds of projects and combinations of projects", and, "agreement upon a statement of principles governing the extent to which various kinds of projects shall be charged to the users and on methods of apportioning such charges."

Method of study.—When this assignment was given the National Resources Committee, an exploratory study was promptly set up under the general direction of the late Dr. Robert Whitten, of New York, and a research was undertaken under his general direction. The research material resulting from these studies included statements and statistics on such subjects as—

The Concept of National Interest (included in sec. 2 of this part),
Federal Grants-in-Aid (included in sec. 2 of this part),
Bases for Division of Costs (included in sec. 3 of this part),
Administrative Problems (included in sec. 3 of this part),
State, Local, and Private Contributions to Federal Projects,
Programming and Timing of Public Works,
Measurement of State Abilities,

together with papers on Division of Costs and Responsibilities in relation to different types of projects including—

Transportation—Highways, Grade Crossing Elimination, Waterways, and Air Transportation,
Large-scale Projects and the Tennessee Valley Authority,
Housing,
Reclamation,
Soil Conservation, and
Local Fiscal Effects of Federal Land Development.

At the request of the Advisory Committee, Dr. Simeon E. Leland later prepared a special summary statement of principles and policies involved, which is transmitted herewith. The following papers are selected from the materials collected in the course of these investigations. Other documents have either been mimeographed for use by persons directly concerned with individual problems or are available in the files of the National Resources Committee.

[1] National Resources Board Rept., Dec. 1, 1934, pp. 5, 62-67.
[2] H. Doc. 395, 73d Cong., 2d sess., pp. 9, 13, 23.

PART III—SECTION 1
PRINCIPLES AND POLICIES

By Simeon E. Leland

PREFACE

At the request of the National Resources Committee these observations on the division of costs of public works have been prepared. They do not represent an inquiry into all of the economic or financial problems involved in a study of public works, nor are they an attempt to evaluate public works as a stabilization device. This task has been done for the Committee in the notable works of Professors Clark and Gayer. This report is based on the assumption that public works have been decided upon as part of a long-run policy for the Federal Government and seeks to fit such a program into a rational financial plan, within which framework the division of costs is discussed.

In the preparation of this memorandum the writer has had the benefit of reading other reports, confidential and otherwise, prepared for the guidance of the National Resources Committee. Many of the observations here made are ably presented in other reports to the Committee. The writer wishes particularly to acknowledge his debt to Prof. J. Maurice Clark, whose inquiry into the Economics of Planning Public Works was relied upon for many of the ideas incorporated here, and who read and vigorously criticized a preliminary draft of this report, as a result of which many drastic revisions were made. The writer is also indebted to Prof. Arthur D. Gayer, whose book Public Works in Prosperity and Depression furnished many of the facts upon which the theories here incorporated were based. He is under obligation to his colleagues, Louis Brownlow, H. A. Millis, and Jacob Viner, for their criticism of this memorandum. The author likewise read the Special Studies on the Cost of Public Works prepared under the direction of the late Robert C. Whitten. These reports, for the most part, dealt with special phases of the public-works program. They were prepared in advance of the formulation of a general policy for financing and dividing the cost of public works. The development of such a policy is the aim of this memorandum.

The writer is likewise indebted to Mr. Rex Morthland, research assistant in the University of Chicago, for the preparation of Appendix A and for assistance in verification of details, reading of proof, and many other tasks. To Mr. William Lougheed, Miss Mildred Fishman, and Mrs. Irene Malone he is indebted for editorial work and proofreading.

Though his debt to others is great, the writer wishes to absolve them from blame for errors or omissions in this report. These responsibilities are his alone.

Simeon E. Leland.

A. INTRODUCTION

Under a unitary system of government the problem of dividing the cost of public works or other public functions does not arise. Under a Federal system the powers, functions, and responsibilities are scattered among the units in the political hierarchy. When activities affecting more than one unit are undertaken by the central government, or when several units jointly undertake activities to satisfy the collective needs of their citizens, the question immediately arises as to how these costs shall be defrayed. Shall they be met by one unit of government? Or shall the costs be divided among the governments affected by, or participating in the joint enterprise? The answer to these questions has been of major concern in the United States in the formulation of a policy toward public works.

The fundamental reason for attempting to divide the cost of public works or other projects affecting the welfare of citizens, is because these activities do not equally benefit the citizens of the government initiating the project, or uniformly benefit the citizens of several governments in the case of joint undertakings. The attempt to divide costs is thus an effort to do justice to the citizens or economic groups inhabiting the territories served by particular governments. When costs are apportioned among the various units of government, what is being done is to fix the tax burden of particular taxpayers or groups of taxpayers. In last analysis, costs are not being divided among governmental units but among citizens and taxpayers in given territories. The problem is thus one of the justice of the incidence of taxation relative to the incidence of benefits from governmental activity. Absolute justice would require consideration of the effects of taxation and expenditure on individual welfare, necessitating in the case of division of costs of

public works the appraisal of net personal advantages, a task so difficult that it would break down in execution, even if suitable techniques were assumed to be available for measurement. As a practical matter, therefore, costs must be divided among citizens of particular governments, unless benefits are so unequal as to warrant the creation of special areas within which costs can be more fairly distributed, or the adoption of special recoupment charges for greatly unequal advantages reaped by particularly fortunate individuals.

In the past, divisions of cost for public works have emphasized apportionments to particular governments. The relative incidence of taxation and the effects of expenditure have received little weight. The sharing of costs of public works and other activities has been accomplished mainly through the extension of grants in aid, recently supplemented by loans to subordinate governments. While the result of the grant-in-aid policy has been to effect a sharing in the cost of various enterprises, the divisions themselves have often been incidental. The National Government has been interested, for example, in the stimulation of certain activities, in the extension of its sphere of control, or perhaps in the equalization of conditions and advantages. Under the circumstances, refined methods of dividing costs have not been attempted. The formulae for sharing costs have been influenced by considerations of political expediency, by the formulation of arbitrary rules of thumb as to apportionment, and by adherence to custom and past experience. For the most part, the divisions have been based on the principle of equal contributions—"50–50"—by the central and other governments regardless of the type of projects to which they were applied. When Federal undertakings were of limited scope these arbitrary divisions were more satisfactory than they are today. Now, the public works undertakings range from local paving, sewer, gutter, water-works or similar improvements, to vast drainage, irrigation, flood-control, or power projects affecting wide regions or the Nation as a whole. With so vast a difference in the scope and type of projects as now exists, the rough and ready apportionments of the past seem to be no longer appropriate.

The problem today is the development of new methods and new formulae for a very different public works policy than has been followed heretofore. In the future it is believed that public works may be utilized as one phase of an economic stabilization program. The cyclical aspects of public works construction will then be emphasized. The construction of projects will be expanded in emergencies and contracted in prosperous times, with a minimum program provided for other periods. Such a concept of public works has an important bearing upon divisions of cost. At certain times the secondary effects, such as reemployment, will have more weight than at other periods, though the direct value of improvements must never be overlooked. The weight to be given to national, local, and regional interests may need to be considered, too, in the light of the economic cycle. Moreover, the public works policy must be harmonized with the general fiscal policy of government and these in turn with the stabilization program and monetary policy of the country.

It is difficult to see how the arbitrary apportionments of the past can be properly applied to such a public works program. So many factors must be taken into account and the formulae applied to one project can scarcely be applied to others without modification that it appears wise to place these determinations in the hands of administrative agencies rather than to leave them solely to Congress. Consequently it is recommended that the development of a public works program be delegated to a Federal public works agency whose authority should extend not only to the formulation of the physical and engineering features of the plan but also to the development of plans for the division of costs. This entire program should be developed cooperatively with representatives of all levels of government involved in the execution of the public works program. This will mean planning for the future and the formulation of future financial obligations. To assist in a proper determination of these burdens, panels of competent authorities, as suggested by the National Resources Committee, should be consulted.

Since the principles, if any, applicable to a scheme of division of costs are so elusive and so much a matter of judgment, it is doubtful if Congress would be warranted in delegating all decisions as to public works to an administrative agency no matter how wise or competent it might be. Congress in addition to providing annual and reserve appropriations to make the public-works policy effective would have to define what type of projects were to be undertaken and the general policies to be followed. It might appropriately fix definite categories of expenditures and even require contributions by subordinate governments, the amounts to be fixed by the planning board. Thus the policy, limits, and framework for effecting the apportionment of costs could be specified, allowing ample freedom at the same time for administrative determination of the details of policy.

Within such a framework the administrative authorities could develop sensible as well as equitable policies with reference to the division of costs. In arriving at these, each case probably would have to be considered on its own merits. Among the factors relevant to these determinations are the following:

(*a*) The volume of public works undertaken, or to be undertaken.

(*b*) The phase of the economic cycle in which the project is undertaken.

(*c*) The type of project for which cost allocations are being developed, with reference to which the interests of particular governments must be appraised. Such interests are usually estimated according to some rough appraisal of benefits to the citizens of the territories affected.

(*d*) The degree of administrative authority in the planning, supervision, and execution of projects lodged with particular governments.

(*e*) The ability of various governments to assume costs, either via taxation, borrowing, or the exchange of services as may be appropriate.

The exact weight to be ascribed to these factors cannot, in fairness, be made a matter of general rule. But if the cooperating units have some voice in their determination, and if expert advice is secured, it is believed that more equitable divisions of cost can be effected than if the allocations are left to legislative determination. The rigidity of such determinations is replaced by flexible administrative decisions. Abuse of such authority can be safeguarded by limitations and declarations of policy prescribed by Congress.

In order to enable the administrative agency to plan wisely for the future, as well as to profit by the mistakes of the past, a thorough and impartial inquiry into the capital improvement program of the recent depression should be undertaken. This should include investigation of the results and experiences from Civil Works Administration, Public Works Administration, Works Progress Administration, Reconstruction Finance Corporation, Federal Emergency Relief Administration, and other agencies. A thorough analysis of the grant-in-aid policy should also be attempted, including the results of the policies of apportioning grants and the matching of funds.

Inasmuch as the ability of subordinate governments to assume financial obligations for public works is inevitably connected with any divisions of cost that are developed, plans for the future should include not only a thorough inquiry into Federal, State, and local finances, but an attempt to correct those conditions which have prevented subordinate governments from carrying a fair portion of the load during the past depression. The problems of finance and of intergovernmental relations can thus be brought into clear relief. Unless improvements are made in these fields in the near future, planning for the future as to public works will be seriously handicapped. This inquiry should be the task of a national commission with broad powers of inquiry, an adequate staff, and an ample budget. It should also be a cooperative undertaking of the Federal, State, and local Governments, otherwise questions of jurisdictional authority would hamper its work.

In addition to bearing its share of a cooperative program of public works during economic depressions (minor as well as major), the Federal Government should finance in toto the construction of projects of major national interest. It should also defray part of the costs of public works undertaken via grants to stimulate local expenditure. The financing of demonstration and experimental projects by the Federal Government should also be assumed. So far as possible, Federal assistance for public works should be limited to periods of economic stress, expanding with such needs and contracting as economic conditions improve. Federal policy should emphasize emergency assistance. Its program in normal times should be minimized.

In order to maximize the possibilities of fiscal assistance and at the same time to enable subordinate governments to assume proper burdens, some of which are impossible because of conditions beyond their control, it is suggested that the Federal Government study the possibilities of creating a single agency to make loans to State or local governments in emergency times, or otherwise, and to assist them generally in their fiscal operations. To assure harmony of policy, such an agency should be closely related to the Federal Reserve banking system.

So important is the complete coordination of fiscal policy, and public works financing and timing with the monetary and credit policy of the Nation that it is recommended that final decisions as to these matters be delegated to a Fiscal Advisory Committee composed of the President, the Secretary of the Treasury, the Director of the Budget, the chairman of the National Resources Committee, and the chairman of the Board of Governors of the Federal Reserve System. The physical and financial plans for public works, including division of cost, would be referred to this committee by the Federal planning agencies. It would determine when projects should be commenced, when they should be tapered off, or when they should stop altogether. Their major task would be the coordination of the public works plan with the plan of national finances, and these in turn with the monetary policy of the country. Without their assistance, complete harmony in a comprehensive stabilization program could not be achieved. So important are the timing and fiscal aspects of public works policy that divisions of cost must be shaped with reference to them.

B. PUBLIC WORKS POLICY AND FISCAL IMPLICATIONS

There are few subjects considered by the National Resources Committee so important nor so controversial in their economic aspects as that of public works. As an instrument of economic policy the role of public works is frequently exaggerated; as a phase of the planning movement, the orderly development of the patrimony of the State will continue irrespective of the vicissitudes of the economic cycle; as part of the fiscal programs of government, public works will tend to conform to the current needs and requirements of citizens. How to stimulate the development of national resources through carefully planned public works; how to integrate these plans with sound economic stabilization policies; how to divide the costs of a national public works program involving the cooperation of state and local units of government are major tasks requiring those interested in the subject to traverse intellectual frontiers where wide divergencies of opinion exist and where much research remains to be done. The desideratum is not only the formation of a socially wise but an economically sound and consistent policy from which current practices have sometimes widely departed.

Nature of a Public Works Plan

In the formulation of a consistent policy for public works the planning, economic stabilization, and fiscal aspects of any program must be both harmonized and integrated into a single plan. A final statement of this policy must follow the formulation of a fiscal program and the development of a policy as to cost allocations. The fiscal program must conform to and embrace the conclusions in other spheres reached by the appropriate governmental authorities. These conclusions in turn must rest upon an economically sound foundation else a proper fiscal policy cannot be developed. So interrelated are all phases of the public works program that a final restatement of the position of the Committee as to a national public works policy will have to integrate them all.

The special problems involved in deficit financing and in the development of a revenue program to defray the costs of a public works program will not be directly considered in this report. It is assumed that any deficits incurred to maintain public services during a depression or to finance a public works program commenced at such a time can be covered by loans without resort to inflation and without endangering the stability of national finances. Indeed, it is the obligation of the United States Government so to maintain its credit that this can be as easily accomplished in the future as during the late depression. It is assumed, moreover, that the national revenue system shall not only be fiscally adequate to meet the demands made upon it during depressions but that it shall be able promptly to retire the public debt—or to prevent it from accumulating permanently—during prosperous periods. Nor is it sufficient that ample funds are provided; the taxation methods employed should be sanctioned by economic criteria so as not to retard the stabilization sought through public works and kindred measures.

In certain respects the present revenue systems of American governments violate these criteria, especially when the regression in State and local taxes is considered. Even within single revenue systems the conflicting economic effects of the taxes employed need to be removed. Nor is there any attempt to relate the total of taxes employed to the national wealth and income. Objects rather than individuals are ordinarily seized upon for taxation with the result that the system as a whole bears little relationship to personal capacity to pay. When funds are needed untaxed objects are generally levied upon—seldom is the attempt made to develop a system of taxation. The various levels of government, too, select their own courses of taxation—all without insight, some without inquiry, into the impact upon ultimate sources of tax payment or the economic consequences produced by the exactions. Chaos rather than system describes American taxation methods. There is no national plan or scheme of taxation. Until there is some coordination in the fiscal policies of our governments, some order in their revenue systems, few long-run policies for the division of costs of public works can be developed. Anything that is attempted will be but a makeshift resting largely on a foundation of political or fiscal expediency. To bring order into such fiscal chaos and to upset time-worn shibboleths would seem to require the appointment of an intrepid national committee clothed with powers broad enough to inquire not only into the fiscal policies pursued by the Nation but by the States and localities as well. Its task should be the development of a national revenue system, the realignment of public functions, and the reformation of the structure and mechanism of government.

If present conditions can be improved, important changes may be accomplished in governmental fiscal policies and relationships. This, of course, is a part of the problem of fiscal planning. With things as they are, however, the ability of State and local units to assume a share in the burden of public works costs or to assume any additional tax burdens may well be limited. Such impediments, if they exist, cannot be glossed over. The public works policy must embrace them and attempt to improve them. That the reve-

nue systems of all governments may be reformed must also be taken for granted, but it is not for this report to pass beyond the discussion of division of costs to suggest reforms for particular tax systems. That is the task of a special revenue commission whose appointment can be recommended not only for the sake of the fisc itself but also because no ultimate division of costs of public work can be developed until governmental interrelationships are improved and the revenue devices of the various governments are integrated into an efficient system.

A Public Works Policy

Before any discussion of division of costs of public works can profitably be undertaken, some decision must be made as to the type of policy to be pursued and for which the costs are to be divided. Are public works to be undertaken as an economic stabilization device, or merely as simple construction projects designed to increase the sum total of useful public improvements? Are public works to be a temporary, spasmodic, or a continuing activity of government? Are public works to be carried out as fast as plans are developed and congressional approval secured or is construction to be reserved, as far as possible, for depression emergencies? Is the public works program to be an adjunct of unemployment relief plans, or is the public works program to be the major stabilization device to be supplemented by other relief aids when necessary? Decision as to these questions must be made before a program of the division of costs can be developed.

In order to have a framework within which the division of costs can be discussed it is assumed that the National Government has decided to employ public works as one phase or instrument in its stabilization policy. To maximize this aspect of public works, it is essential that planning should be carried on continuously. The plans developed should cover not only new improvements but the replacement of old facilities, many of which may be obsolete or inadequate. In planning public works a series of zones or priorities will have to be set up within which projects can be cataloged, depending upon the urgency of construction. Some projects it is, of course, impossible to postpone. Others may be held in reserve for a few years and still others can wait even longer. If sufficient attention is devoted to replacement of existing capital and the renewal of equipment the flexibility of the public works program can be increased. Many assets, such as schools, public buildings, water works, etc., continue to render public service long after the time their replacement appears to be desirable from the standpoint of reducing maintenance costs. The postponement of these replacements for limited periods may not therefore interfere with the performance of public service. If the rates of obsolescence are carefully studied the timing of renewals can be made a part of the public works program. The potential volume of such improvements may be substantial. An inquiry into this would be appropriate.

Three types of plans seem to be needed: (1) Projects for normal year-to-year construction; (2) projects reserved for minor depressions; (3) projects reserved for major depressions. The allocation of projects to these separate zones requires continuous planning and the revision of the program to keep pace with technological advances, population shifts, changes in demand, construction costs, and similar factors. The postponement of construction allows engineers and others to take account of these changes and thus improve the details applicable to different projects. Postponement of construction may thus lead to improved plans. This is one of the real economies of advance but continuous planning.

Those projects which cannot be postponed, or which are needed to meet the requirements of a growing population or urbanization drift or similar factors must be undertaken currently. Yet if a spirit of foresight is developed some of these projects may be transferred to the second group to be constructed during minor emergencies. In this zone also belong those projects which are fairly urgent but which can be postponed a few years though perhaps not until the coming of the next depression. Finally, there are those projects held in reserve for major depressions. In projects of the first type there is little cyclical planning. Many of the works ordinarily done in this zone appear necessary, or impossible of postponement because no foresight has been employed in appraising public needs. This lack of foresight is often tantamount to postponement.

Where stabilization is one of the aims of public works it is desirable to minimize annual construction where possible in order to increase activity in depression periods. In the minor crises the normal program of public works would be supplemented by the construction of the then most urgent improvements. Experience gained here would be valuable in meeting more serious crises. Moreover, major depressions in their early stages often resemble minor ones and thus one stage of public works activity may dovetail into another. If stabilization is to be part of a public works plan it is essential that advance planning cover the three zones indicated above. It should be recognized also that in times of dire economic distress public works alone will not provide all of the relief for unemployment that is necessary, nor will it even dispense with the need for social insurance or direct unemployment relief. Both of these will doubtless be required in every major depression. It is believed,

however, that a well-planned and properly executed public works program may decrease the resulting direct relief burdens and materially assist in the improvement of economic conditions, provided, of course, that proper financial devices are employed in meeting the costs of the public works program.[1]

If public works are to be expanded in times of economic depression, it necessarily follows that they must be curtailed in times of recovery and prosperity,[2] not only because construction in the depression period should have provided a "surplus" of improvements above the necessary requirements of the latter period but because an increase in activity at one time necessitates the withholding or storing of activity at another. When public works are not needed for stabilization purposes a curtailment of activities is warranted and the building of a reserve of projects for future use is called for. Some elasticity in the public works program is thus required, but the degree to which construction can be postponed is determined by the urgency of public needs, by the degree to which these needs are anticipated and by the cyclical character of the planning program. The problem of when to begin public works construction and when to curtail these activities are crucial questions requiring technical economic guidance and the decision of competent authorities.[3] The guidance of a technical committee in the problem of timing is necessary to remove the public works plan from the realm of political tinkering.[4] Unless the expansion and contraction of public works —timing—are properly done as an integral part of a comprehensive stabilization program, the efficacy of public works will be greatly lessened. If improperly timed the result may be to nullify some advantage achieved elsewhere by Government action.

The experiences of the present depression demonstrate that plans for economic stabilization should be developed before depressions are at hand. The time to avoid many of the economic consequences following in the wake of depressions is during periods of recovery and prosperity. It is essential, therefore, that whatever stabilization policy is to be developed for meeting these economic problems should be developed at once and improved over the years by continuous work. Likewise the plans formulated should be consistent with the fiscal policies of government and the fiscal policies of government should be reciprocally consistent with them. The policies pursued in both fields during depression and prosperity should be consistent as a whole. The benefits achieved in one phase of the economic cycle should not be nullified by inconsistent and unwise policies pursued in another phase of the cycle.

Traditional Public Works Policies

The cyclical public works policy just outlined stands in sharp contrast to the policies hitherto pursued by the various American governments. Prior to the recent depression—and through it for many political units—the traditional policy of expanding and contracting public works with similar fluctuations in business was followed.[5] When business boomed so did public works; when depression came public works practically stopped. Improvements were constructed, as a rule, whenever the electorate authorized them and the "need" seemed to correspond with the ability to secure initial funds for construction,[6] while later repayment of borrowings often entailed great difficulties. The optimism of good times was propitious for expanding public works; the gloom of poor years bred a desire to reduce public expenditures and outlays so as to minimize tax burdens. Notions as to budget balancing also contributed to the development of the traditional public works policy. Any other policy would require advance planning which few governments prior to the depression had undertaken. A number of municipalities such as Schenectady, St. Paul, Kansas City, Detroit, Cincinnati, and St. Louis had prepared long-range capital improvement programs where future needs were anticipated and current needs were systematically coordinated into plans financially feasible. These programs, however, were the product of a prosperous era and did not approach the public works problem from a cyclical point of view. Hence when depression engulfed the Nation most of these plans were swept aside. Indeed some of the communities, such as Detroit, were confronted with grave financial problems of finding funds to cover debt requirements on outstanding loans. A few localities, such as Rochester, did undertake to stabilize local economic conditions through the continued construction of public works during the depression but with little effect on economic conditions. Certainly

[1] See Gayer, op. cit., pp. 385–395.

[2] Cf. Ibid., pp. 395–96: "If unemployment continues for a prolonged period of years as a result not of cyclical fluctuations but of deep-seated forces involving secular readjustments to basically changed conditions, as happened, for example, in Great Britain and Germany during the post-war decade, public works cannot, of course, be expected to provide increased employment permanently except at the cost of at least an approximately equivalent contraction of private expenditures."

[3] When should the program begin? As soon as unemployment exceeds the average—i. e., at the first appearance of the economic distress labeled "depression"? Or should public works be commenced after liquidation has proceeded to such point that price maladjustments generally have disappeared? Opinions of economists differ on this. For consideration of each point of view see, for example, Clark, op. cit., pp. 66–67; Slichter, The Economics of Public Works, Am. Ec. Rev. XXIV (March 1934), 174–85.

[4] See infra, pp. 119 ff

[5] Cf. Bielschowsky, Business Fluctuations and Public Works, Quart. Jour of Ec. XLIV (February 1930), 287; Gayer, op. cit., pp. 36 ff.; Dickinson, Public Construction and Cyclical Unemployment, Annals CXXXIX (1928), 175–209.

[6] Cf. Hansen, Economic Stabilization in an Unbalanced World, p. 188

stabilization through public works cannot be undertaken with probability of success by single municipalities or by units not possessed of ample financial (credit) resources. Even single countries face some difficulties in undertaking extensive public works activities during world-wide depressions.[7]

The economic consequences following the pursuit of this traditional policy seem obvious. The bulk of improvement financing was by way of loans, made at a time when the expansion of public debts contributed to the inflation of credit and the increase of speculation. The increased demand for construction materials and labor at such times tended to raise prices and wages. Competition for loanable funds had similar effects on interest rates. With the advent of depression the curtailment of public construction, coinciding with the cessation of private building, increased the deflation of the construction industry and added to the volume of unemployment, idle goods, and unused capital. Failure to decrease debts in prosperous periods, together with the reduced tax and other revenues of the depression, left many municipal obligations in a precarious financial position. A few defaults created what many denominated "a crisis in municipal finance", which, coinciding with industrial prostration and bank failures, started a contagious paralysis in public activities and a wild deflationary hysteria in State and municipal finance.

Without a stabilizing policy to guide them, governments so acted as to deflate themselves and the economic communities dependent upon them. The lack of a cyclical fiscal policy left State-local governments free to adopt, to their economic detriment, the worst possible of policies. Nor had the Federal Government developed a long-run point of view as to its finances. It had set up sinking funds for the retirement of the public debt and just after the close of the World War established an annual budget system. Nevertheless it maintained a year-to-year point of view as to its finances. It approached the recent depression without any advance plans and scarcely seemed to know for a time whether it should balance or intentionally unbalance its budget. In prior depresssions the Federal Government had not appropriated funds for relief nor had it undertaken the expansion of public works. Cyclical fiscal policies thus were a departure from tradition.

Objectives of a Cyclical Public Works Program

The objectives of a cyclical public works program are both to provide the community with desirable capital assets and to help regularize the course of the economic cycle. By increasing aggregate spending at a time when individual spending is being curtailed, public works tend to offset reductions in total spending and thus contribute to the maintenance or increase of employment and the demand for goods and services.[8] To the degree that these consequences result, public works tend to stabilize or improve economic conditions. To accomplish the latter, public works must augment the aggregate of spending by governments and individuals. The mere transfer of spending from individuals to the Government will not help, except to the extent that the governmental agency might spend more efficiently than private citizens. If, perchance, it did not, there would then be a net loss to society. What is needed, therefore, is an increase in total expenditure and not a transfer of spending from individuals to the Government.[9] It is believed that this may be accomplished in times of depression by the inauguration of a public works program financed primarily by loans.[10] Such loans seldom interfere either with individual spending or saving as they tap funds lying idle in banks, in financial portfolios and individual reserves.[11] By employing such idle capital, which accumulates in every depression, the Government, through its public works program financed by loans, may be able to increase the aggregate of spending without encroaching upon the private use or employment of capital, labor, or economic resources. As recovery proceeds, however, the ability of Government to tap idle funds decreases as competition for labor and resources by private industry grows.[12] Hence economic benefits from public works decrease

[7] Wa ming, International Difficulties Arising Out of the Financing of Public Works during Depression, Ec. Jour., XLII (1932), 211; Gayer, op. cit., pp. 396f.

[8] Bielschowsky, op. cit., p. 286.

[9] To the extent that a successful public works policy decreases expenditures for relief the total public works outlays do not represent a net increase in aggregate spending but merely a transfer within the accounts of the Government. Other offsets within the public fisc may occur so that the net increase in public spending may be less than the total for public works.

[10] "If the Government, either by borrowing or taxation, acquires funds which would otherwise have been spent privately, the public spending of those funds is a mere shifting, not an increase in the aggregate. But if Government acquires funds which would not otherwise have been spent (and borrowing is the more likely method of doing this), then when it spends these funds it does increase the aggregate" (J. M. Clark, Cumulative Effects of Changes in Aggregate Spending as Illustrated by Public Works, Am. Ec. Rev., XXV [March 1935], 14; cf. Clark, Economics of Planning Public Works, pp. 35–36, 38 for words of similar import).

[11] "* * * there is usually during depression periods a surplus of idle funds seeking secure investment at attractive returns, which private business is unable or unwilling to utilize in the face of uncertainty, declining prices, and excess productive capacity, its use by public bodies need involve no transfer inasmuch as the capital would otherwise not have been employed at all" (Gayer, Public Works, Encyclopedia of the Social Sciences, XII, 697).

[12] "Since there is no simple and obvious way, short of printing new money, in which government can be sure that the funds it acquires would otherwise have remained wholly idle, an estimate becomes necessary of the percentage of the public expenditures which is really expansionary, considering methods of financing and the state of the capital markets. In a depression, public borrowing can easily secure funds which private industry would not otherwise use, but as revival proceeds, this becomes more difficult" (Clark, Am. Ec. Rev., XXV, 17).

with recovery, necessitating, for maximum economic advantage, the gradual curtailment of public works, the cessation of borrowing, and the rapid repayment of antecedent debts. The efficacy of a public works policy depends, therefore, largely upon the choice of financial methods selected, upon the magnitude of the program undertaken, and upon the timing of its expansion and contraction.

In stabilizing the course of economic events, public works expenditures at the same time provide capital such as improvements, fixed assets, and machinery for public uses of the people of the United States. It is the need of citizens for services requiring the use of capital assets which justifies the inauguration of any public works program. It is immaterial to citizens, too, whether their needs are supplied by one unit of government or another so long as services are provided on the most efficient and most economical basis. Governments, it must be recognized, have no needs of their own. Their excuse for being is simply to satisfy the wants of those governed. They enjoy the benefits from public works, ultimately provide the capital, and in the end defray the cost. This fact should not be overlooked in any discussion of the division of costs of public works. Fundamentally, the problem is not a division of costs among governments, but the imposition of charges upon the people of the Nation for the acquisition of capital assets. What is to be done and who should defray the costs are fundamental questions.

To meet the needs of the population of the Nation a vast capital structure has been provided. Much of the investment is private in character, comprising, for example, the mercantile, manufacturing, transportation, and financial systems involved in the satisfaction of daily wants. The investment in the private as distinct from the governmental sphere is determined largely by the rates of return earned, as well as the hopes for reward, upon the capital so employed, the element of security being an important determinant. Through the mechanism of prices, interest, wages, rent, and profits, the amount of capital so employed is adjusted to something approximating the needs of society. The lags and advances here are phases of the business cycle, and whether cause or effect produce problems of great magnitude. It is under such a mechanism, subject in part to alteration by planning and governmental control, that the bulk of human wants are satisfied and the private capital of the Nation is allocated to particular uses. Supplementing this structure, society through its governments has employed capital in the construction of hospitals, highways, water works, canals, street railways, incinerators, disposal plants, parks, bridges, schools, libraries, and innumerable other improvements. The amounts so invested have been determined roughly through the mechanism of a democratic government by processes calculated approximately to measure public needs and the public will. For better measures or standards of judgment determining the amount of the investment, its locus, the timing of expenditures, and the means of payment, progressive governments have been groping. The planning movement is an attempt to answer some of these questions and to direct attention to others. The Public Works program likewise is an attempt to provide capital assets not only in accordance with public need but at a time to maximize their economic utility in the stabilization of economic conditions.

Major Problems

In making capital available to the people of the United States, three major series of problems may be identified. The first concerns the acquisition of capital involving the timing of the investment and the utilization of the program for stabilization purposes. The second involves the administration of the investment, its initiation, planning, and the management of the enterprise in which capital is sunk. The third set of problems is related to the payment or the allocation of costs. These problems are present whether capital is privately or publicly employed, but it is only with public capital as exemplified by public works that this memorandum is concerned. These problems affect all levels of government and strike through the structure of government irrespective of the level initially affected. It is useless to attempt to discuss public works from a purely Federal, State, or local frame of reference. So complex are the problems that the interests of particular units are difficult to segregate or identify. The role of any particular government is subordinate, therefore, to the functional unity of all and the ability of the combined mechanism so to gear itself that the needs of the population and its economy may be completely served. Nor can the problem be discussed from the narrow point of view of mere fiscal policies, political implications, or economic consequences. Every phase must be considered and integrated into a comprehensive, systematic, social policy.

Responsibility for Public Works

Often the attempt to fix responsibility for public functions or public works, or the effort to identify the interests of particular governments is a masked attempt to shift the burdens of cost from one group onto another. The interests and responsibilities of particular units merge whenever the needs of citizens are counted. It is lamentable that in the American commonwealths there is no instrument for implementing governmental unity or effectively coordinating public services. The lack of cooperation and understanding between the Federal Government and the States, for

example, is in part due to the fact that the executives and officers in these units seldom meet to discuss major problems and as infrequently are called into conference by the President so that national policies can be explained to them. One reason why this is seldom done is because the policies of all of our governments are largely opportunistic. When policies are developed in advance they can at least be revealed and explained to units whose cooperation is sought. So long as 48 States can largely offset by contrary policies (or no policy at all) the action of the National Government,[13] some plan should be developed for cooperative joint action on matters affecting all levels of government.

Without specific provision in the governmental framework for coordinating intergovernmental fiscal policies or for providing the machinery for developing an intergovernmental public works program, the task has naturally devolved upon the Federal unit because of the catholicity of its interest, its great resources, and its acknowledged leadership in promoting the general welfare of the entire Nation. Nevertheless, it is difficult to agree that it is the task of any particular government to make capital available for the needs of its population or to undertake public works programs for their benefit. The citizens of each unit of government are also citizens of the next higher unit in the political hierarchy. The fundamental problems involved in the decision as to what government shall undertake given activities concerns the incidence of benefits conferred by those services and the incidence of resulting taxes required to defray their cost. Here the unit selected is important because the tax base and the areas affected are material considerations in arriving at a just decision. These problems are related to the division of costs and not to the acquisition of capital.

[13] Cf. Gayer, Public Works in Prosperity and Depression, pp. 350–351: "Despite the unusual efforts exerted, public works throughout the country, Federal, State, and local, far from increasing shrank in some 3 years to little more than half their previous total volume. Although Federal outlays grew rapidly, their increase was more than offset by the steady decline in the public-works expenditures of local governments, State, county, and municipal. Even in the latter half of 1933, after the restraints imposed upon the expansion of public construction by adherence to the gold standard had been removed, and with over $3,000,000,000 made available for public works as part of a program of thoroughgoing 'reflation', construction expenditures still showed little increase, and recourse was had, in the shape of the Civil Works Administration, to more direct methods of increasing purchasing power.

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despite the absence of adequate preparation, much was actually accomplished in expediting public construction in certain limited directions during the depression, notably, as shown above, by the Federal Government, and especially in road building. Indeed, had local authorities, State, county, and city, expanded their construction expenitures as greatly as did the Federal Government during the depression, the dollar value of total construction, public and private, which declined from $13,000,000,000 in 1928 to $4,000,000,000 in 1932, would have remained almost constant while its physical volume, if we allow for the decrease in construction costs in the interval, would not unlikely have shown an increase."

Normal Subordinate to Emergency Policy

Any policy as to the division of costs of public works should be developed primarily with reference to emergency periods, the policy for other years being subordinate thereto. To be successful in emergencies, the volume of public-works expenditures must be large. The expansion of public works in emergencies implies their curtailment in normal times—among other reasons because a temporary "surplus" of improvements should have been provided during the preceding emergency. Of course, not all construction can be saved for depression years. To get a proper volume at such times may require enough public-works expenditures at all times to keep the planning machinery continuously in gear and to maintain a skeletonized machine in those specialized branches of the public-construction industry where transfer from private enterprises could not be readily effected.[14] Such a policy would enable public works to be quickly expanded when economic necessity requires. Nevertheless, the primary emphasis in public works planning should be with reference to economic depressions. This emphasis is difficult to secure because in prosperous periods depressions tend to be forgotten. Moreover, when desirable projects are formulated, the natural pride of public planners and engineers in seeing their work consummated tends to make postponement to depression times more difficult. Even the population is apt to place a higher value on works undertaken today than on improvements reserved for construction in the future. Political administrators ordinarily are reluctant to postpone the construction of improvement projects in the fear that the glory or credit for doing them may be reaped by their opponents. Particular departments, too, plan their outlays without any relation to a planned policy of public expenditure or a cyclical program for capital outlays.[15] Both within and without the Government, therefore, provision for the future tends to be discounted. Yet, in planning public works, their greater utility in depression periods should not be overlooked. If a cyclical debt policy is adopted for financing public works,

[14] Some public construction such as roads, bridges, water filtration, sewage, etc., seems to be highly specialized and conducted largely on Government account. Perhaps the normal public-works program will maintain sufficient activity here to make expansion easy in time of need; if not then the normal policy should be framed to compensate for this deficiency. On the other hand, many public improvements, such as building construction, landscaping, public-utility construction etc., are regularly carried on by private industry so that construction on Government account merely represents a transfer of such activity to another field. If correctly timed, this transfer should come in depressions when the private demand has fallen off. The public-work projects should also be curtailed with recovery as such demand increases if optimum stabilization is to be achieved. There is little point, therefore, in trying to maintain a skeletonized force in industries of this type.

[15] Cf. Douglas, The Problem of Unemployment, pp. 216–17.

involving alternate debt expansion and contraction in depression and prosperity, these consequences may, by reason of the necessity for debt repayment, tend to maintain the cyclical point of view in the planning and execution of public works.

If, however, the public-works program is developed for normal years while plans for economic emergencies are left out of account, or their development is postponed until depressions appear, numerous difficulties may be encountered in financing these projects. The credit reserve so necessary for financing them without impingement upon profitably employed resources may be greatly impaired.[16] Moreover, great difficulties will be encountered in starting public works in depression times. Not only will their commencement be delayed, but even the formulation of programs may be tardy.[17] Fortunately, however, the National Resources Committee and the related State planning boards have taken steps to avoid this contingency. The Committee has likewise attempted to arrange its activities so that plans for public works will be available in time of need. Every effort, however, should be made to emphasize the necessity for giving precedence in planning to the emergency period.

The expansion of public works in depression times comes at a period when the stimulus to employment is imperatively required and when public works least interfere with private employment and the private use of capital. The customary program in years of recovery and in times of prosperity increases the competition between Government and industry for the use of labor, funds, and resources. It tends to force up prices when, if anything, they should be reduced. For such public works as are constructed in normal times costs ordinarily should be provided directly out of increased taxation. But the taxes so imposed should not interfere with the speedy retirement of the public debt. While the competition of Government for labor and materials may tend to increase prices, the increased taxation necessary to finance improvements on the pay-as-you-go basis may be regarded as economically beneficial for the reason that it may tend to retard saving, speculation, plant expansion, or other activities flowing from the use of surplus funds which tend to turn prosperous periods into booms and these in turn into depressions. Taxes for debt repayment have similar tendencies. Even sales taxes in such times may produce effects economically to be desired.

The consequences of diverting tax revenues from debt repayment to the acquisition of new capital should not be overlooked. To the extent that taxation for debt repayment is decreased rather than increased in prosperous periods the consequences of depression financing become more acute and the stabilization possibilities of public works programs in depression times become more limited. Hence the public-works policy for normal times should be planned with reference to the emergency expansion of public works so that not only will a consistent construction policy be followed through depression and prosperity, but a complementary financial program may be evolved for these periods as well. The possibilities of employing public works as a stabilization device indicate the primary importance of subordinating normal policies to those for emergency periods.

If the development of a public works policy for normal years controls the formulation of a long-time national public works program, the tendency may be to shift financial burdens from central to State and local units. In such periods there is no national employment emergency to call for Federal financial support, even though the stimulation of public works in which the National Government is interested may at such times be desirable. This can be done, however, through grants calculated to meet the requirements of normal years and sufficient only to bring forth the requisite local support.[18] Improvements in normal periods can be excepted to meet local demands. Increasing population may perhaps call for additional schools; complications in urban traffic may necessitate improved streets; the growing congestion of cities may call for the expansion of recreational or sanitary facilities. These requirements should for the most part be financed locally in normal times and, aside from Federal grants to stimulate construction in spheres in which the National Government is interested, they do not appear to call for Federal subventions. However, with the approach of economic emergencies, local interests do not loom as large as before. The stabilization aspects of public-works programs tend to receive larger emphasis than in normal times and as unemployment grows national interests tend to be stressed. Local abilities to meet the normal capital requirements of expanding populations and changing life become inadequate to meet the fiscal burdens created by national economic emergencies. When such emergencies occur, costs for meeting them must be shifted, in part at least, to larger political units endowed with greater financial resources. Thus, the formulation of emergency policies with reference to

[16] Such has been the predicament of many American States and municipalities during the recent depression. The maintenance of a credit reserve available for emergencies is wise fiscal strategy.

[17] "Experience with stimulated public works during the depression served to demonstrate on the one hand that long-range advance planning and budgeting are absolutely indispensable for success; and, conversely, what might be accomplished with adequate preparations". Gayer, Public Works in Prosperity and Depression, p. 351.

[18] For a discussion of grants, see pp. 64–67, 122, *infra*; also appendix A.

public works will probably tend to place a greater share of the financial burdens of such programs on the central government. The less planning there is for the future the greater the probable burden to be thrown upon the National Government. The smaller the part in preparing future plans accorded to State and local units the greater the probable share of costs to be assumed by the Federal unit. Subordinate governments doubtless would be willing to assume greater burdens if they share in developing plans for the future than if the program is imposed upon them from above. Indeed they may assume greater burdens than can wisely be discharged. Cooperative action and advance planning would tend to make possible both the balancing of conflicting interests and the determination of feasible financial burdens.

Relation of Public Works to Government Program

Not only should policies with reference to public works be developed for emergency periods, with programs for normal years subordinate thereto, but a public-works program must be subordinated to the general program of governmental activities so that the two form a coordinated and consistent whole. As ordinarily conceived and as generally practiced, governments pursue one policy with reference to general activities and another with reference to public works. Little stability (and practically no planning) is observed with reference to the performance of ordinary functions. Contradictions are observed in almost every sphere of ordinary expenditure as contrasted with the policies pursued in expanding public works. Although the economic problem of stabilization in a depression is one of expanding aggregate expenditures, governments have been wont to expand public-works outlays and at the same time to curtail ordinary services. Public works are a logical thing to expand, "if there is to be expansion", Professor Clark has explained, "but not otherwise." [19] He also regards the stabilization of essential current services of Government as coming first in importance and ahead of public works in a stabilization program:

> As a general principle, it may be laid down that stabilization of at least the essential current services comes first in importance, and expansion of public works in time of depression comes second. One is tempted to put this in more absolute form and say that, until stabilization of essential current services is provided for, no attempt should be made to expand public work in dull times. But such a hard and fast formulation encounters the difficulty just mentioned; namely, that no one can be sure whether existing provisions are or are not sufficient to stabilize expenditures through a major crisis of the future, whose seriousness and special characteristics cannot be foreseen. Thus, all that is possible to lay down is that, before undertaking programs of expanding public works in times of depression, there should be sufficient provision made for the maintenance of regular current governmental services to afford a reasonably adequate prospect of success in meeting any but the most unusual and most serious strains.
>
> Such provisions for stabilized spending would not afford a positive remedy for depressions, but would at least avoid making them worse by adding the effects of shrinking public outlays to those of shrinking private expenditures. It would be a distinct improvement over the existing system and would represent a benefit not to be despised. Furthermore, unless stability in general current expenditures of Government is first achieved, there is little or no point in talking of remedying depressions by increasing expenditures on public works. To spend more money and to take on additional workers in one section of the Budget, while cutting appropriations heavily and laying off employees whose salaries come in another section of the Budget, seems a strange and inconsistent method either of increasing employment or of bringing about a desirable total amount of expenditures. It amounts to keeping the desire for economy and the desire for increased spending in thought-tight compartments and attempting to satisfy both at once.[20]

It will be recalled that due to the demand for economy and balancing the Budget, many salary reductions and curtailments in the ordinary activities of government were made at the time when expansion of total expenditures by way of public works was being undertaken. The beneficial effects from expansion in one sphere were thus offset, in part at least, by the deflation of expenditures in another sphere.

The inconsistency of this policy cannot be used as an argument for the maintenance of individual salary scales nor in justification of the continuance of particular expenditures. In many cases it was desirable to reduce individual salary scales and wages in order to bring rates of remuneration for such services into line with market conditions and rates of pay for competitive work, or even to make possible an increase in the total number of employees for the same total wage payments. Likewise, the elimination of wasteful expenditure, the curtailment of nonessential services, or services for which current demands have slackened are always in order, as is the attempt continuously to adopt improved and more efficient methods of doing business. Changes of this type are appropriate at any and every phase of the economic cycle. Funds saved by such economies could appropriately be transferred to the support of other and more urgent needs in the public budget to the end that the aggregate of public expenditures for ordinary services would not be decreased in depression times. Transfers of this type would prevent the maintenance of artificial wages and prices but at the same time they would not reduce the total purchasing power flowing from governmental operations.

It is the total wage bill and total expenditures which, from the stabilization point of view, are im-

[19] Clark, Economics of Planning Public Works, p. 77.

[20] Ibid., p. 76.

portant. If salaries are reduced only to the extent that living costs fall, there may be said to be no reduction in community purchasing power because of changes effected by Government salary reductions. The savings from such reductions may be utilized in employing additional workers on needed tasks. Thus total wages may not be affected. But if salary cuts are disproportionately large compared with the decline in the cost of living, the aggregate purchasing power of the nation may be affected, particularly if no added laborers are employed or the funds saved are not transferred to other uses. And, if funds thus saved to taxpayers are simply hoarded by them the constriction in total purchasing power contributes nothing toward economic rehabilitation. Thus, what is done in connection with ordinary governmental services may nullify in part the benefits of increased spending coming from the public works program.[21] The pursuit of such a contradictory policy is tantamount to laying off one set of workers, or reducing their purchasing power, in order to hire another set of workers, or increase the purchasing power of other individuals.[22] It is important, therefore, that governments adopt an economically consistent policy with reference both to ordinary and public works expenditures.

It is likewise true that the distinction frequently made between ordinary and emergency activities and expenditures often involves contradictory economic policies. It is sometimes assumed that current ordinary expenditures should be curtailed and that emergency expenditures should be increased. There is no merit from a stabilization point of view in this distinction.[23] The merit consists in the practical one of tending to satisfy fallacious popular beliefs concerning the operations of the public fisc. The popular fetish concerning a balanced budget being what it is, a certain amount of political security may come from balancing the Budget for ordinary expenditures or from the institution of economies and the infliction of salary reductions upon ordinary employees. Political security may, indeed, be promoted by these practices if budget-balancing is an important consideration in determining how people act with reference to Government operations, particularly as these things affect their attitude toward public borrowings during a depression. Efforts should be made to expose those fallacies of public finance which render difficult the development of economically sound fiscal policies in depression and other times.

[21] Cf. Ibid., p. 105.

[22] Ibid.

[23] Ibid., pp. 117–118. The practical advantage of separations between an ordinary and an emergency budget for clarity or information as to Government operations is not in issue. Nor can such separations be condemned so long as the Budget embraces total and not partial operations. Difficulties arise when emergency expenditures are excluded from the general Budget. This gives only a partial picture of Government operations.

State and Federal Policies

It is likewise desirable that the fiscal policies pursued by the Federal Government and by State and local units should harmonize. This is one of the major tasks in planning a program for the future. During the recent depression such harmony was seldom in evidence. When the National Government was endeavoring to expand the aggregate of public expenditures by way of direct relief and public works, State and local units were cutting salaries, curtailing services, and applying horizontal cuts to many activities. Capital improvements were almost stopped; borrowing, except for relief requirements was scarcely undertaken. The increased demands for relief services during the depression led to the increase of many State and local property taxes, contributing to a retardation of business, as such taxes tended to increase the overhead costs of producing goods and services. At the same time increased property levies further increased tax delinquency, added their weight to the collapse of property values, and increased the severity of the economic depression on owners of taxable property. The demand for current funds led also to the adoption of numerous sales and transaction taxes, the effect of which was to increase sales resistance and curtail somewhat the sale of commodities the demand for which was elastic. Numerous regressive imposts were added to the already staggering burdens placed upon the poor and those in the lower income groups, decreasing their ability to absorb the products of private industry. The demand for liquidity on the part of bank depositors and the financial stringency leading to the bank holiday drastically impaired the market for short-term loans customarily offered by State and local governments and generally restricted the market for longer-term issues by these same units. Thus, while the Federal Government was endeavoring to prime the pump through relief and public-works measures, State and local agencies were, in part, nullifying these tendencies by the pursuit of economically contradictory programs. Unfortunately no machinery has yet been provided through which greater harmony in fiscal policy can be secured for the Nation and its constituent units.[24]

Relation of Public Works and Relief

It is important, too, that a definite relationship or definite policy be developed with reference to public works and the relief program. The relief policy pursued during the recent depression was in part one of direct relief, relief work, and public works. It proceeded from stage to stage as expediency seemed to dictate. Of course, the depression engulfed the country before any plans for the coming emergency had

[24] See pp. 20, 119–120.

been laid. In the future this error should be avoided. Such, of course, is the aim of the National Resources Committee in promoting the long-range planning of public works.

The kind of public-works program considered in this memorandum assumes the construction of capital assets at current wages under proper conditions with the most efficient machinery, technology, and instruments at the command of the Nation. It involves production at current wages for real work with employment dependent upon no tests of need or ability to provide relief. The benefits from a public-works program are envisaged as those flowing both directly and secondarily from the utilization of the instruments of production at market rates of remuneration. Relief work should not be made a phase of the public-works program per se. If a public-works program cannot provide all of the necessary relief for unemployment, then direct relief or relief work should be employed as supplements to it, but they should not be confused with the public-works program else attitudes toward this important stabilization device will change and the beneficial effects expected from its prosecution will be materially minimized. The administration and execution of the two programs should be kept distinct. Moreover, if the public-works program is subordinated to relief plans, improper attitudes toward the public-works program will soon develop. It will soon degenerate to a point where it is neither real work for real wages nor, perhaps, even work for relief. These difficulties can be avoided if a permanent policy for relief is developed and likewise if a permanent and comprehensive public-works program is evolved. The experiences in this depression should make possible wise planning for the future in this regard. Enough mistakes have been made to benefit by them.

A Complete Program

It must not be assumed, however, that public works alone comprehend all of the essential elements in a national stabilization policy,[25] nor that public works, when supplemented by relief or social insurance, will provide all of the necessary constituents of a successful stabilization policy, nor that if these are supplemented by a consistent fiscal policy, involving the normal and emergency activities of all levels of government, will that suffice. The field comprehended must include the whole range of prices and services—wages, interest, rent, distribution of income, credit, speculation, taxation, fiscal policy, production of goods and services, saving, spending, unemployment relief, insurance, and all related subject matter.[26] As Professor Clark has pointed out,

> A proper public-works policy depends on what is done in these various fields, and vice versa.
>
> * * * It appears to be an inevitable next step in the development of our governmental organization that there should be a definite governmental unit of some sort in which all the problems of this field of policy should be brought together and considered as a whole. How to correlate such a body with the rest of the governmental agencies is one of the important and pressing questions which we face in adjusting our governmental structure to its present tasks.[27]

It is to such a body that the development of a public-works program, with its timing and its cost allocation problems, must be referred.

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[27] Ibid.
[25] Ibid., p. 147.
[26] Ibid.

C. DIVISION OF COSTS

Economically, the problem of division of costs of public works is not one of transferring costs from one government or set of governments to another, but rather from one group or set of taxpayers to another. To consider the problem of division of costs as a problem in intergovernmental relationships is to obscure the major problem of the shifting of tax burdens. This shifting of tax burdens is the inevitable result of imposing the cost of public works on one set of governments or another. Each in turn must raise its share of the costs from taxpayers under its jurisdiction. Inasmuch as the territorial basis of tax jurisdiction becomes more restricted as burdens are transferred from Federal to State governments and from State to local governments, the fundamental question involved in any assumption of financial obligations to pay for public policy is simply, what group of taxpayers or what taxpayers in a given area shall assume or carry the burden of public-works costs.

To the extent that the same fiscal devices for raising funds are not equally available to all units of government, decisions as to division of costs for public works may involve the transfer of costs from one set of pockets to another. For example, the Federal Government can, through its income taxes, defray the cost of public works by using the proceeds of these taxes to meet the interest as well as amortize the loans floated to finance the public-works program. The productivity of these taxes will increase with business prosperity and to the extent that the works program is effective in helping to improve business conditions that will be reflected in the increased yield from the progressive income-tax rates. These taxes are, in the main, paid by those in the higher income brackets, who are in a position to pay most liberally without curtailing personal consumption, involving the restriction of the demand for goods and services. The adverse effects upon trade and production in depres-

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sions will be at a minimum when highly progressive income taxes are employed. In prosperous periods when such incomes reach their maximum, these rates again, by diverting large shares of the national income from speculation and private investment to the repayment of the public debt, tend to help depress booms and thus contribute toward the stabilization of conditions on the upswing of the cycle. At any time, too, these taxes take their toll only from those who have received surplus incomes [28] and are therefore more able to pay. Thus, a Federal public-works program tends to be financed by those who can best afford it. The greater the relative importance of the personal income tax in the national tax system the more operative this tendency becomes.

States with personal income taxes, and similar ability measures, have the same potential power to finance public works, subject to the limitations on their taxable resources, but their actual ability to do this is severely curtailed not only by the Federal preemption of the income-tax field but by the unwillingness of many neighboring commonwealths to tax persons on their income at all. The rates of State income taxes reach their maximum in North Dakota with a rate of 15 percent in the top bracket, while the Federal surtax rates carry a maximum of 75 percent.[29] The lower exemptions of the State taxes make them less of a surplus tax than that of the Federal Government. If, therefore, State rather than Federal income taxes were used to finance a public-works program (via bonds) the burden would be more regressive than if the national tax were used. Consequently greater interferences with trade—due to the reduced fee incomes of those in lower brackets—could be expected. From a purely economic point of view Federal financing from Federal income-tax receipts is to be preferred to State financing from State income taxes.

Few States are free, however, to devote income taxes to the support of public works in depression years. These revenues may be needed to finance ordinary activities or to maintain balances reduced by shrinkages in other revenues, which may have declined even more drastically than State income-tax receipts. To the extent that rates are increased above the level of competing States the exodus of persons and capital may be encouraged. Similarly a premium is placed on the use of tax-avoidance devices. These practical limitations on State taxing power may not be as effective as the constitutional or other legal limitations under which revenues are raised. Many States cannot impose income taxes at all; others cannot reform their antiquated property taxes; some, by choice, care to do neither. This condition contrasts sharply with the almost complete freedom of the National Government to fashion its own revenue system.

The existence of many of these impediments to freedom in taxation has caused some States to turn to sales taxes for revenues during the depression. In actual operation these taxes tend to be regressive, tend to curtail trade and production, and to the extent that they cannot be shifted to consumers fall arbitrarily on business with little relationship to ability to stand the impact of such taxation. About the worst possible thing to do during a depression is to impose taxes which either are regressive in their effects or which tend to restrict trade.[30] If a public-works program had to be financed by such taxes the benefits to be expected from it would be drastically reduced. There is something to be said, during the later stages of the recovery period, for the imposition of taxes which tend to curb trade and production, but their employment during depressions should be discouraged. If, then, attempts to divide the cost of public works result in the shift of taxation from net incomes to sales, from abilities to inabilities to contribute, the plan is not made palatable economically by being disguised as a "State assumption of burdens."

As the limits of State revenue policy correspond less with the ability principle than do Federal so are local financial possibilities more restricted than those available to States. The primary source of local tax revenues is the property tax, the defective character of which has led to the development of other sources of revenue by the States themselves. As the States have gradually abandoned this source of revenue they have developed and kept for their own use the more productive sources of taxation, which likewise are best adapted to centralized administration. The development of State corporation, inheritance, income, gasoline, motor vehicle, and other taxes are illustrations in point. As a result there is ordinarily left for local use the property tax, special assessments, fees, and miscellaneous revenues comprised in part of minor licenses and departmental earnings. The possibility of expanding revenues from these sources to the point where they can be employed to cover a substantial portion of the costs of a public-works program is decidedly limited. Indeed the need for such expansion, and perhaps the limits reasonably possible, may have been reached during the depression in the attempt to diversify local fiscal systems for the purpose of relieving the burden on property tax payers. The tremendous delinquency in these taxes, following the collapse of real-estate values and the depression shrinkages in ordinary incomes available for paying taxes, has indicated the very limited possibility of increasing property tax rates in the near future for any purpose, including public

[28] That is, those above the personal exemption.

[29] For various rates see Tax Systems of the World, 6th ed.

[30] As to use of such taxes during booms cf. p. 26, supra.

works. While authorities may disagree as to the proper level of property taxation there can be little doubt that substantial increases in present rates during depression times will be reflected in increased tax delinquency. Thus increases in these rates become, in part, self-defeating. In addition numerous property taxes operate in the nature of fixed charges or overhead costs and fall with increased severity upon business enterprises in lean years, making difficult the adjustment of prices for goods and materials. Increases in such taxes in depression years only add one further obstacle to economic rehabilitation. The attempt to shift a portion of the cost of public works from the national to local governments may thus constitute, in the last analysis, the transfer of a tax burden from a proper to an improper tax base. As costs tend to be passed from Federal to State to local governments the likelihood of economically undesirable taxation increases. These tendencies should not be overlooked in drafting plans for the future.

The problem of dividing costs for public works is little different from that involved in every expenditure by the National Government. Who is benefited, for example, by the construction of a battleship, or the opening of a national park? Is it the citizens of the Nation as a whole, or the citizens of lesser areas within the Federal territorial domain? Do all of the citizens benefit uniformly or do the benefits fall unequally among those governed? Are the persons benefited proper parties to bear these costs? Are those benefited able to assume the costs involved?

These questions arise in every case of Federal expenditure. Who derives the primary benefits from the Boston Navy Yard? Is it the people nearby, or the residents of Nebraska? Does the Nation benefit from the Panama Canal, or only the coastal commercial centers? Are the national parks a local improvement or a recreational facility enjoyed by the country as a whole? Is flood relief for the Mississippi Basin a national enterprise or the concern of that drainage area? What of reforestation, irrigation, land reclamation, the promotion of agriculture, the subsidizing of infant industries, the location of post offices or post roads, forts, canals, and the like? Whatever may be the incidental gains to regions, localities, or neighborhoods from the construction of these facilities or the performance of other services, the activities in question were undertaken in the national interest and for the promotion of the general welfare. They were not undertaken merely to satisfy State or local needs or interests.

Public-works projects may thus be divided into two categories: (1) Those with a national interest and (2) those involving something less than national concern. Appropriate and different financial policies seem to be called for in each case. For example, the Federal Government has, under certain circumstances, financed such public works as flood control, irrigation, drought relief, land reclamation, or reforestation. It is doubtful, on the other hand, whether it should substantially contribute to the construction of sidewalks, sewage systems, curbs and gutters, street lighting, traffic signals, and similar projects involving primarily local interests and needs. To be sure, it can stimulate such construction, it can assist through loans, technical advice, etc., but it is doubtful if it should pay the entire cost, or substantial portions of the total cost, of such projects. Its financial obligations should not exceed its functional interests. Where the Nation as a whole receives benefits the central government can properly assume all public-works costs, if necessary, but where only limited areas or groups are benefited it is questionable whether the diversion of national resources for localized gains is appropriate. In some cases the lines of demarcation between what is of national and local concern is clear; in other cases it is a matter of doubt. Despite the difficulties of decision in particular instances, different financial policies seem to be called for in each case.

The greater the territorial extent and the scope of activities of the central government, the greater the likelihood that particular expenditures will confer special benefits upon groups or areas not shared by the Nation as a whole. Yet few question the necessity for supporting Federal expenditures by taxes imposed uniformly throughout the territorial jurisdiction of the National Government. It is the special benefits, the uncommon or nonuniversal advantages, which raise questions as to the equity of appropriating Federal taxes to such purposes. So far as national interests are served, and national interests predominate, no questions arise as to the propriety of particular expenditures. But when revenues are taken from one set of territories, usually those where the citizens are most able to pay, and a portion of the funds is spent in territories where those least able to pay, but equally deserving of national services, are made the beneficiaries of public expenditures, questions as to the equity of appropriations sometimes arise. These problems, generally ignored in the field of general governmental expenditures, have been brought to the front in connection with public-works expenditures by continued discussion of the problem of division of costs.

It should be clear that what is being considered is not the division of costs among the units of government, but the ultimate division of payments among groups of people—taxpayers—in the United States. The propriety of given allocations varies with different types of public works and even among the same kind under diverse circumstances. After the divisions

have been fixed, choice must be made as to the source of funds. The failure of general methods of cost allocation to reach those specially benefited, or the unequal incidence of benefits on some who reap uncommon gains from public works, leads to the ethical demand for some further imposition of costs, not upon particular governments, but upon specially benefited individuals. Charges for these benefits may be termed "recoupments" and their place, if any, in the financing of public works will be later considered.[31]

Other factors affecting the division of costs of public works among units of government are: (1) The volume of public works or the amount of expenditure involved; (2) the time of construction; (3) the type of project; (4) administration of funds or execution of plans; (5) the ability of particular governments to cover their portion of the costs. Perhaps no one of these factors may determine whether it is feasible to consider a division of costs. For example, the volume of public-works expenditure necessary to promote economic stabilization may be so large as to make the financing of such a program an impossibility for any unit except the Federal Government. Or it might be so small as scarcely to warrant Federal assistance. Other projects may be fiscally possible provided a number of States join in the undertaking.

The timing of construction may be such, in the case of depression, war, or a catastrophe, as to exclude from participation in financing any governments except those having an ample credit reserve, stored treasures, or hoarded funds. If plans for future emergencies are laid in advance the possibility of financing such programs by a division of costs is greater than if nothing is done to prepare for them. The probable recurrence of the cause for expenditure may also affect the fiscal policy to be adopted.

The type of project, too, determines the extent of governmental financial participation. It has been assumed by some that if a project were one of only local interest, neither State nor Federal funds might appropriately be solicited to help defray the costs of such improvements. State projects by the same argument were thought to be the obligation of that unit. The interests of each were also measured largely by the groups served or the territories initially affected. Stabilization or economic rehabilitation have generally been left out of account. The interests measured have been those directly served by the improvements themselves. But with economic stabilization, the improvement of employment, and kindred aims as secondary objectives of a public-works policy the question arises as to the effect of these secondary consequences on the division of costs of public works.

[31] See p. 78, *infra*.

Secondary Effects

In normal times these effects are given little or no weight, but with the increase in unemployment in depressions the value of improvements in and of themselves tends to be pushed into the background as the desire to foster economic rehabilitation increases. Sometimes the value of the improvements is completely overlooked in the desire to stimulate employment and the demand for goods and services. Emphasis on these secondary considerations tends to make the problem of financing public works look more and more like a Federal responsibility, particularly when subordinate governments may not be in a position to expand construction activities at their own expense. The inability of subordinate governments to carry a fair portion of the cost of a program of capital improvements may be merely a temporary disability to be corrected by loans or grants rather than by the assumption of total costs by the Federal Government. It is easy to justify the assumption of the preponderate burden of a public-works program by the National Government when an unforeseen emergency arises, or when what is likely to be a recurrent event happens for the first time, but there is little justification in formulating a program for the future which casts the total costs on the Federal Government because of past inabilities of subordinate units to equip themselves for the task. The first step in planning for the future is to see if State and local finances can be placed in a more favorable position for meeting possible emergencies. If this can be done these units, in the future, may be able to carry that part of the public-works burden most nearly corresponding with their proportion of the direct gains. If, on the other hand, no attempt is made to correct the defects in State-local tax systems, or to improve the machinery of fiscal administration, or to assist subordinate governments in the formulation of proper policies, the Federal Government can expect these units, in future emergencies, to plead their inability to assume a fair proportion of the burden of the cost of public-works construction. Any planning for the future should, therefore, include the improvement and coordination of the fiscal systems of all levels of government.[32]

Self-Liquidating Public Works

There is of course no real problem of dividing costs in the case of self-liquidating public works.[33] The problem here is primarily one of advancing capital, or making loans to permit the construction of such projects. The problem is cyclical only in part, involving

[32] Cf. pp. 34–35, *supra*.

[33] The decision as to whether public works should be of a self-liquidating type or provided out of general revenues does not come within the scope of this report.

loans to public industries or governmental departments, which in turn, by the operation of their properties, will later come into possession of the means for repaying the advances made. Eventually the costs of construction can be amortized from profits or from prices, tolls, fees, etc., collected from the users of services. Bridge tolls or public-utility earnings, for example, can be so employed. The real question involved in such cases is whether such services should be paid for by the general taxpayer or by the consumers of particular services. Decisions on this vary as different social groups are required to make them. A discussion of the considerations by which these decisions should be made are outside the scope of this report.

When certain projects are put on a self-liquidating basis it may be assumed that it is for the purpose of collecting costs directly, including capital investment, from the users of these services. Where this is done the role of Government—Federal, State, or local—may appropriately be to advance capital so that the project may be set in operation. Repayment will come naturally from the users. There is no real division of costs here. The governmental agency merely provides capital. It acts as the intermediary—the bank—transferring funds from those who have loanable funds to those who want to use them and for which they are willing to pay interest as well as assume obligations to discharge the initial advance. The process may involve the loan (transfer) of the credit of one government to another, or even the use of the facilities or personnel of one government by another. These aids may involve some costs to the lending agency but the advances per se are simply transfers. To the extent that loans are repaid the fisc of the lender is not ultimately involved. To the extent that repayments are not made, losses may be sustained. The assumption of these risks may well be the contribution of the Federal Government—or even of subordinate governments—to the stabilization of economic conditions, or to other needs of citizens.

The volume of self-liquidating projects is scarcely sufficient to contribute materially to economic stabilization. Moreover, various projects of the self-liquidating variety frequently tend to compete with private business. In the long run, of course, this must be disregarded if governments can more economically satisfy the wants of consumers. Nevertheless competition from Government-financed enterprises may make it difficult in depression times to transfer capital from industries adversely affected by such competition. In extreme cases Government competition may cause the liquidation of private enterprises. Some of the difficulties may be generated or exaggerated into fears as to what government may do to business through competition or regulation, with the result that businessmen may hesitate to expand production, make new investments, increase capital outlays, or otherwise react so as to offset, in part, the pump-priming tendencies created by the public-works program. To the extent, of course, that self-liquidating projects merely transfer capital or productive activity from the private entreprenеurial domain to the sphere of governmental functions there is only a transfer of resources and activity. No net additions to capital resources or purchasing power would result from complete transfers. Gains in one balance sheet would be offset by losses elsewhere. Seldom, however, can an exact balance be struck. What functions government should perform is both a political and an economic question. The choice involved is whether users should pay under a regime of public or private prices. Seldom are questions of the division of cost involved after the policy of self-liquidation has been adopted.

Should Costs Be Divided?

There are some who say that it is not a question whether public-works costs should be divided, but rather that they must be shared by the Federal Government with subordinate units. Such assertions are based upon the assumption that the National Government cannot afford to carry the financial burden of a comprehensive public-works program, that such a program has unbalanced its budget and has pushed the burden of taxation to a peak unprecedented in America. Those who hold this point of view generally discount the benefits accruing from a public-works program in an emergency, and frequently assert that if such a depression program is to be carried on, a portion of the costs must be imposed upon State and local units. If the Federal Government, embracing the entire population and resources of the Nation, has neither the taxable capacity nor the credit reserve sufficient to carry this burden, it is difficult to see how 48 States and the innumerable lesser units acting singly have any greater ability to assume the total or any portion of the load. The State and local units simply possess fractions of the taxable resources of the Nation. If 5 billion dollars, 10 billion dollars, or perhaps 50 billion dollars is to be spent on public works, the funds therefor must come out of the national income or national wealth, or both— or out of that of the citizens of any given territory undertaking such a program. That the Federal taxation resources and credit are amply able to carry the burden of any emergency public-works program likely to be undertaken may be easily demonstrated. This exercise need not be repeated here. The ability of the entire Nation to carry the load is not an issue in connection with the division of costs. The question of who should carry the load

is not answered by asserting that the Federal Government is unable so to do. The real question is, What group of taxpayers can fairly be asked to assume a portion of the cost, and in what degree?

The division of costs of public works, in short, divides the burden of the works program among the people of the Nation in a proportion different from that achieved by national taxation. The individual and territorial incidence of burdens is readjusted. Some of the consequences of such divisions have been mentioned.[34]

In one respect the division of costs of public works among Federal, State, and local governments may ease the work of the Federal Budget Director or that of the Secretary of the Treasury. If the appropriations of the National Government are reduced the Budget Director will not have to find so much cover for expenditures. The Secretary of the Treasury may not have to borrow as much to cover current deficits as he otherwise would, nor will these officers and other Federal officials need to spend so much effort in the improvement of the Federal revenue system, either in developing a more effective administration or a series of new taxes. These efforts would be saved by any reduction in expenditures, regardless of the source or motive. However, the small amount of labor saved these individuals will be more than offset by the added difficulties placed upon State and local financial officers in meeting added costs by reason of decreased Federal participation in public works. Such advantages, while not going into the merits of proposals on division of costs of public works, are none the less at times real factors to cope with in the development of economically wise fiscal policies. All too frequently in the councils of the Nation have those with improperly timed theories as to annual budget balancing and kindred ideas been in a position to determine economic policies with reference to the national fisc. If plans are made in advance and for a long-run program many of these factors may be avoided.

In a major economic crisis an adequate, consistent, comprehensive plan for economic stabilization involving increased governmental expenditures, either for current services or public works or both, may appear to be possible only through Federal authority, Federal action, and the tapping of Federal financial resources. At such times only the credit of the Federal Government has provided an adequate and thoroughly reliable source of funds. Nevertheless substantial sums were raised by State and local governments to meet relief needs of the recent depression. During the 5 depression years from July 1, 1930, to June 30, 1935, the States spent $533,000,000 on relief—barely 4 percent of all their expenditures[35]—a part of which represented costs of acquiring capital assets. Of the sum spent on relief during this period $295,490,000, or 55.4 percent, came from loans.[36] The balance of $237,456,000 came from tax revenues.[37] Of this sum approximately $76,368,000 represented the yield of State sales taxes for the years 1932–35.[38] During the fiscal year 1935–36 the yield of these taxes for relief was estimated to be $91,317,000.[39] There can be no question, therefore, but that some of the costs of public works can be collected from, or imposed upon State and local governments. The loans, of course, harmonize with fiscal tendencies pursued by the central government but the taxes involve numerous impediments to trade revival. The latter have largely been avoided by current methods of national taxation. This is one reason at present for favoring the Federal assumption of public-works costs in depression periods, but as a long-run condition it may not be operative. It depends upon the course taken by future tax reform movements in the State-local field.

To the extent that the Federal Government does not finance the public works depression program, the real problems from an economic standpoint are: (1) To make its credit reserve available to State and local units and to provide the means whereby these agencies may avail themselves of this credit;[40] and (2) to provide an equitable division of costs among the territories served and among the taxpayers there involved, either by grants-in-aid or some other device.

Federal Loans

Unfortunately, no permanent machinery has yet been provided whereby Federal credit may be made available to State and local units. A beginning has been made, however, through the emergency advances by the Reconstruction Finance Corporation and the Public Works Administration. The possibilities of creating a Federal credit bank or a Government financial corporation or a division of the Treasury to make such loans should be carefully investigated. Not only would the establishment of such an authority make possible the more effective financing of public works in emergency periods, but it could if desirable, also provide the impetus and basis for control, guidance, and counsel in State and local finances badly needed even in normal times. The presence of such an authority and its cooperative action in meeting kindred financial problems might do much to harmonize as well as integrate,

[34] Cf. pp. 19–20, *supra*.

[35] Ecker-R., State Relief Borrowing, F. E. R. A. Monthly Report, August 1935, p. 4.

[36] Ibid., p. 3.

[37] Ibid.

[38] Ecker-R., The State Sales Tax as a Source of Relief Revenue, F. E. R. A. Monthly Report, October 1935, p. 6.

[39] Ibid.

[40] Clark, Economics of Planning Public Works, p. 73.

in the long run, the financial policies of Federal, State, and local governments. It could make the economic, financial, and credit resources of the Nation available to the political entities serving the country and its people. From such an agency State and local units could borrow with the same freedom and under the same rules as are applied by private bankers, though perhaps the costs of borrowing might not be as great, particularly if competition with private banks for loans were effective. This source of funds would be open at all times, even in those periods when banks were trying to maintain a very liquid position. Its operations could be correlated with those of the banking system so that the monetary and fiscal policies of government could be harmonized. To assure this the credit bank or corporation should be directly related to the Federal Reserve System.

If the Federal Government were willing to make loans to State and local units the ability of these units to assume a portion of the costs of public works could be greatly increased. Under present arrangements, where these units can borrow money only through commercial banking institutions, their need for loans often comes at a time when the banks are unable, or unwilling, to grant them. This situation is operative both in the field of long- and short-term borrowings. In the case of short-term borrowings in 1934 (for the period after Mar. 10) the various local governments in the United States needed $907,800,000, of which the banks were willing to loan only $456,000,000. Inability temporarily to finance short-term requirements not only led to the deflation of ordinary services, in spite of the issuance of local script by many municipalities, but also carried with it the inability to float long-time loans needed, in part, to participate in the early relief and public-works programs of the recent depression. These conditions were effective, among other things, in the development of the emergency loan policy of the Federal Government.

Two difficulties, at least, contributed to the usual situation. In the first place, governments in the United States have depended upon private banks to act as their fiscal agents in the flotation of loans. Both the ability and willingness of these institutions to underwrite State-local borrowings decline as the potential demands of their depositors for cash tend to increase. The second difficulty relates to the standards applied to determine the eligibility of governments for loans. It has been customary for bankers to insist on "adequate" security measured in part by balanced budgets, assessed valuations, tax rates, tax collections, volume of delinquency, increasing population, etc. Self-liquidating ventures have been appraised on the basis of earnings as to the probability of repayment. The construction of public assets has generally been assumed to be an adequate basis for loans, provided other factors were favorable. Conformity to legal niceties has always been insisted upon in addition for the protection of bondholders. The propriety of many of these factors as a gauge for credit extension cannot be questioned, nor can the relaxation of many of them be urged. But the propriety of numerous conditions imposed by bankers in making loans is nevertheless open to criticism. Their insistence on annually balanced budgets is not always in order nor is the maintenance of large cash balances explainable except as tending to increase loans, or private profits. Nor are property valuations alone a safe guide for credit extension. It is ability to repay loans from aggregate revenue resources, not simply from property taxes, which is material. The use of ratios of indebtedness to property valuations is both an inheritance from physiocratic philosophy and a remnant of the property-tax era within which most State constitutions were framed. They offer little protection to bankers when the real-estate cycle is considered.[41] Likewise, the prevalent notion that capital expenditures are a satisfactory basis for loans, whereas current public expenditures are not, needs exploding.[42] The fundamental difference between governmental institutions with power to divert national income and resources to public use and private individuals with limited incomes, uncertain tenure and doubtful longevity has not been recognized sufficiently by private bankers. Nevertheless, government credit has tended to be appraised by the same yardstick as personal loans. If the central government set up a mechanism whereby loans could be made to subordinate agencies some of these fallacies might be corrected. More favorable terms could be extended, interest rates perhaps could be reduced and credit might be granted more liberally in time of need.[43]

On the side of State-local governments changes are also in order. The supposedly sovereign States have through illiberal constitutions denied themselves, for the most part, complete freedom in taxation. Many States have limited their choice of revenue devices to those approved years ago by the constitution framers. Some States have even limited the rates applicable to particular taxes and not a few Commonwealths have prevented themselves from ever adopting progressive tax rates until the constitutional debris is cleared away. Until the States get complete freedom to tax according to legislative will, protected by the customary declaration in bills of rights, many of them doubtless will be hampered in the development of equitable systems of taxation and probably will not be able to participate fully in their own economic rehabilitation

[41] Cf. Hoyt, One Hundred Years of Land Values in Chicago.
[42] Cf. Clark, Economics of Planning Public Works, p. 77.
[43] For further discussion see pp. 124–26, *infra*.

from depressions. Similarly the experiences and excesses of the era of internal improvements of the pre-Civil War period have been incorporated into constitutional inhibitions on the right to borrow, and sometimes to spend, public funds. Some States even are prohibited from lending their credit or similarly assisting their own local governments. If flexible public works are to be a national policy these restrictions must be removed else proper State participation in costs will be hampered. Increased public intelligence on these matters appears to be a better safeguard to the States than traditional constitutional restrictions. If State constitutions can be arranged to give their legislative bodies increased freedom in framing tax laws and in extending credit to subordinate units, where such powers do not now exist, the development of equitable policies for the division of costs of public works will be greatly facilitated.

Grants

Grants can also be used not only to transfer credit resources from one government to another, but as a means of apportioning costs. Central governments can share credit resources by granting portions of the proceeds from their own loans to subordinate governments. These grants can be made conditional, requiring State or local contributions, as well as the use of funds on particular projects or within limited times, or other appropriate requirements.[44] If matching of funds is to be required it might not be unreasonable because of the economic effects of unwise taxation to specify, as a condition to receiving subventions, the source of contributed funds. Such stipulations have not been made conditions precedent to Federal grants although in State fields they are not unknown. For example, eligibility to receive State educational grants is often made conditional on the imposition of local property taxes of prescribed amounts. So far as the writer is aware, no negative prescriptions have been imposed on the source of funds. While a State may without great criticism specify fiscal policies for its municipalities as conditions precedent to receiving State aid, it is certain that if similar conditions were imposed by the Federal unit they would be resented as an interference with State-local financial policies. Such reactions would not increase the effectiveness of the public works program. Perhaps it is best to limit Federal conditions in re grants to the use of funds per se with no restrictions as to the origin of revenues contributed by subordinate units.

If subordinate units are to bear a portion of the cost of public works, grants may be employed by the National Government to equalize the severity of burdens thus assumed. Equalization of cost has been one of the objectives frequently claimed for State aid, especially in the field of education. Thus, appropriate techniques might be developed whereby similar equalization might be applied to public-works costs. Generalization here is difficult, as well as hazardous. What can, as well as what should, be done can only be determined by all of the facts relating to specific projects. Nevertheless, as a device for dividing costs, grants are quite important.

Moreover, they may be regarded as a means for fixing the maximum amount of Federal expenditure on given projects or available in certain territories. Should other governments desire to spend more they would be free to do so as the grants limit only the amount of expenditure by the unit making the grant. Even if the grants require the equal matching of Federal expenditures, no limits are placed on additional expenditures in excess of the minimum. Of course, the more liberal the grant the less likelihood is there that it will be supplemented by more than the minimum expenditure. In the case of public works, localities, for example, may desire finer schoolhouses than the central unit might care to finance. Local supplements could then be made. The natural result of grants in some fields of activity is, thus, to stimulate additional expenditures on the part of recipients of aid. When this happens, the aggregate of expenditures on public works is thereby increased. The stimulation of public works will, however, be subsequently considered.[45]

From many points of view the responsibility for the development of an economic stabilization program seems to be a national obligation. The economic conditions necessitating the formulation of such a policy have flowed directly from the development of an economic order based upon a division of labor and the territorial specialization of trade and commerce. An economic depression may be a national catastrophe affecting unequally different areas within the Nation with an intensity reflecting the degree to which economic interdependence has flowed from the specialization of industry. Single localities can neither be blamed nor held responsible for the unemployment within their borders, nor can many of them individually assume the financial burden of unemployment relief, not to mention the underwriting of a public-works program to improve their economic life. What holds true for single localities is to a lesser degree true of many Commonwealths. A national emergency calls for a national plan of action. For the future it involves advance planning of both the physical features and the financial undertakings, including among the lat-

[44] For a summary of major provisions of present Federal grants, see Appendix A

[45] See pp. 122 ff., *infra*.

ter the formation of policies as to the division of costs. It may be argued that the Federal assumption of costs tends to place the burden upon the group most able to defray expenses and upon the largest possible social group over which the costs of the collapse of the national economic system can be spread. These arguments are advanced to justify proposals that the Federal Government assume the entire burden of a public-works program to stabilize economic conditions flowing from depressions. Whether the central government is justified in assuming all such costs depends on the extent to which national interests are involved. It is one thing to do it in a depression for which there has been no fiscal planning; it is quite another matter to formulate such a policy for future crises. Is economic stabilization so important to the Nation that the gains to regions, States, or localities from the works projects per se or their operation can be completely overlooked?

Division of Costs—Real Burdens

Some persons feel that the costs of a public-works program are materially reduced if a portion of the burden is imposed upon State and local units. If it be true that the imposition of costs upon subordinate units of government actually reduces the amount of expenditures which otherwise would be made on account of public works, the resulting decrease in aggregate spending because of this fiscal policy will, therefore, reduce the beneficial effects flowing from the public-works program. From the stabilization point of view it is the increase in aggregate spending which is the desideratum rather than the division of costs among political entities. If the economic effect in the division of costs is simply to transfer the financial burden from the United States Government to other governments, the citizens of the Nation as a whole are no better off but, as has been previously stated, the transfer may change the incidence of the tax burden both as to individuals and territories affected.[46] With State and Federal tax systems as they are, the attempt to shift public-works burdens from the Federal to State and local Governments may have the tendency to place more of the costs on lower-income groups than if the financial burdens are assumed by the central government.[47] The experience of the recent depression indicates the limited extent to which State and local governments may assume added financial burdens in times of economic stress. Under such circumstances many arbitrary divisions of costs are intolerable.

For those units able wisely and economically to assume a portion of the public-works costs an eclectic policy must be developed. This is possible only if considerable administrative discretion is permitted, and if the public-works program with its finances is cooperatively planned in advance by representatives of all participating governments. Instead of attempting to develop a system of division of costs it is far better to think in terms of developing methods to promote the assumption of costs. This should be part of the planning enterprise. Along with the preparation of the physical, engineering, and technical features of improvement programs should go the development of alternative financial plans. The promotional work necessary to secure approval of particular projects should include the promotion of plans for the assumption of costs by subordinate governments to an extent coextensive with their interests in given projects. Many projects can best be undertaken as joint enterprises by several governments with costs distributed among them. Where no division is possible plans may have to be rejected, or filed to await a change of official opinion or await a change of circumstances such as to warrant Federal assistance. Such possibilities and others are involved in financial planning.

Difficulties in Planning Public Works

The forces preventing numerous State and local governments from assuming increased financial burdens for public works, and incidentally of unemployment relief, have not all been of an economic order. Many units economically capable of bearing moderate portions of the cost of a depression program have been legally impotent to do so. Others legally able to assume additional burdens have been too weak economically to exercise their statutory and constitutional powers. Still other units have had neither the legal nor the economic power to act. Many of these impediments are removable and should be cleared away before the next depression. There have been other agencies, too, that have been opposed to the development of a public-works policy, or the pursuit of any program to alleviate the consquences of the economic depression. Others on political, legal, or philosophical grounds have been opposed to Federal assistance. Many constitutional doctrinaries, too, have desired State rather than national action. Nevertheless, at certain times national problems can be solved only through the prompt action of the National Government. So diverse are the courses and programs of State and local action that many have been led to the

[46] See pp. 38 ff., *supra*.

[47] It is not argued that additional burdens should be placed upon those reached by the upper brackets in the Federal income tax. There is reason to believe that these rates have approached the limit of maximum productivity, for the time being at least. Should additional taxes be necessary they must, perforce, be placed upon those in the lower or middle brackets. What is meant here is that the operative tendencies of State-local tax systems are more of a handicap to economic rehabilitation than are the results of Federal taxation.

conclusion that the only effective road open to the development of an economic stabilization policy for the Nation is through the action of the Federal Government. The necessity for such action may be minimized if plans are now developed for use in the next economic emergency.

The importance of national planning for the orderly development of the resources of the Nation cannot be exaggerated. If a long-run public-works program is to be formulated it should be under Federal auspices. But for best results it should be developed in close cooperation with State and even local planning agencies. Not only is this necessary properly to weigh State-local interests and needs but it is likewise desirable in order to increase the financial stake of subordinate units in the program. If the program is manufactured "at the top", resentments to what may appear to be bureaucratic action may be aroused. "Red tape" may prevent the effective consummation of the program in time of need. If, however, the State and local agencies can be partners of the Federal Government in the planning enterprise—preparing for the next emergency—this cooperative action will tend to develop permanent interests in public works. This, of course, has been the very essence of the policy pursued by the National Resources Committee with respect to the development of physical plans. The idea should be extended so that financial programs are made a part of every suggested public-works plan.

If these programs are developed cooperatively with the State and local units, divisions of cost can be worked out voluntarily, particularly where State-local interests or enthusiasms run high. The burdens voluntarily assumed by subordinate units will very likely be higher than those achieved by Federal action alone or given by way of grants. This, of course, presupposes considerable administrative discretion, which will be discussed later.[48] Moreover, it assumes that the country as a whole is convinced of the value of public-works construction in depression times. In view of the fact that some may doubt the value of this program, it is recommended that one of the first steps in the development of a sound financial plan be a careful study of the benefits conferred, the costs and economic effects of the current public-works program (Public Works Administration) and of the relief adjuncts, such as Civil Works Administration, Works Progress Administration, and Federal Emergency Relief Administration, which involved the construction of public improvements. Even an inventory of the public assets constructed, their worth, cost, and division of financial obligations is an essential prerequisite for future financial planning.

[48] See p. 116, *infra*.

It is difficult to commit any democratic political institutions to future policies. Public attitudes, representatives, and administrators change. Attempts to shift construction activities from one period to another run afoul of these obstacles. This is one difficulty fiscal and physical planners must minimize. Advance education in economic and fiscal policies would be of substantial advantage both in building up public attitudes and in securing continuity and harmony of action among public agencies. Cooperative planning of projects, including the development of financial plans, would seem to assure reasonable continuity of policy among all levels of government, provided that a favorable public attitude toward a cyclical public-works construction is developed. The first step, therefore, seems to be research and investigation; the second, that of conference and cooperative action. The byproduct of these should be an equitable division of costs. In each case the Federal Government should take the initiative and assume leadership.

If the costs of an economic stabilization program embracing a comprehensive system of public works are to be divided by the Federal Government with State and local agencies, it is not because of the economic necessity of meeting these costs. That can be done on a national basis perhaps easier than any other way. It must be because of the belief that an equitable division of burdens cannot be worked out within the framework of the National Government, or because administrative considerations seem to dictate such division. Perhaps allocations are necessary as well to recoup benefits specially conferred. The divisions may even be concessions to expediency, or concessions to political and legal dogmas, or perhaps to other difficulties.

Interests and Benefits Involved in Public Works

A public-works program can embrace construction projects which are (1) of national interest with benefits extending to the entire Nation; (2) it can include projects of primary concern only to limited territories; or (3) it can embrace projects of interest to many territories or regions but yet not coextensive with the interests of the entire Nation. The benefits from any of these projects may be divided into two groups: (A) Those which satisfy the collective wants for the satisfaction of which public improvements in the last analysis are undertaken and (B) those benefits arising from reemployment, from the stimulation of economic activity, from reflation due to credit financing, from the creation of increased purchasing power—in short, the benefits arising from the consequences of the pump-priming activities. These benefits may be denominated as primary (A) and secondary (B). The primary

benefits (A) are those which distinguish productive from unproductive improvements. They denote public assets. It is the ability of expenditures of this type to satisfy collective or social needs which gives them a fundamental economic justification. Mere spending does not necessarily fulfill this requirement. All public and private expenditure, whether for current services or capital outlays, produces economic consequences of the secondary (B) variety. Some types of expenditure produce more of these effects than others and the amount created varies from time to time in different phases of the business cycle. One of the prime advantages of a public-works program as a stabilization device is the fact that it tends, with the wise selection of projects, to confer upon society valuable community assets at the same time promoting economic stabilization. The better the projects selected the more lasting will be the permanent benefits from the program. On the other hand, it is possible to spend money in such a way that few real needs of society are satisfied and the major gains—if they are to be viewed as gains—consist in the secondary effects created by putting money in circulation. This, of course, was one of the early justifications of governmental expenditure. It antedated the recognition of want-sating through public activities. To say that these secondary economic effects in themselves constitute a valid basis for public works may be to argue the economy of waste or to create a boondoggler's paradise. The public cannot be satisfied with mere expenditure of national resources productive solely of stabilization effects. Until the list of necessary improvements and desirable outlays is exhausted there is no place for a mere spending program. Useful labor and needed improvements come before boondoggling. The latter need never come.

If, however, the prime requisite—ability to satisfy society's need for capital improvements—is present, then emphasis may be placed temporarily upon the subsidiary effects, the stimulation of productive activity. In depressions this may be important enough to make even what are ordinarily local improvements a matter of national concern. The Federal Government may even be justified in assuming the cost of initial activities designed to stimulate the increase in productive activity. but as economic conditions improve the necessity for Federal support decreases. Likewise the need for placing the entire burden on the National Government decreases as plans are prepared prospectively for use in subsequent depressions. The more the burden is thrust on the Federal Government for the sake of economic rehabilitation the more is the worth of a public-works program made to rest on the giving of employment and the circulation of money than on the material results and satisfactions from the improvements themselves. The stabilization effects pertain only to the timing of the works, not to the construction of the works themselves.

In a severe depression, if other levels of government are unable to carry a portion of the public-works burden, then, by default, the Federal Government may be forced to do it. Or, if an example must be set, the National Government should assume the leadership, but in the development of a future program the entire burden for all types of public works cannot fairly be cast upon the National Government. It can be expected to contribute to the extent of its interest. National projects it may be called upon to support in their entirety, subject to recoupment for special benefits not universally conferred. To the support of other projects it should contribute to the extent that circumstances and the interests of its entire population warrant. Among these interests, economic rehabilitation as a secondary effect of public expenditures should have some, but not too much, weight. What precisely each contribution should be is a question of fact in particular cases, necessitating, it is believed, a large element of administrative determination as well as discretion. Nevertheless a major portion of the problem of financing public works in the future is the present removal of obstacles to State-local financial as well as administrative participation.

If it is decided that governments should contribute to the cost of a public-works program to an extent coextensive with their primary and secondary interests, the problem remains of deciding the extent of those interests. Whether a particular activity is of national, local, or intermediate concern is frequently a matter of opinion. The question closely resembles the determination of what is a Federal, State, or local governmental function. The only principle apparently available for the determination of this question is that of benefit. What area or group is benefited by the activity in question? Many of the benefits are intangible; some are immeasurable. What a government is to do is determined fundamentally by counting opinions. Its activities, in the long run, are shaped by the wishes of the majority of those governed, the precise decisions generally being left to legislative assemblies. Perhaps this offers the clue as to what should be done in sharing the costs of public works. Congress can be called upon to say what expenditures in the national interest are sufficient to warrant the assumption of total costs. It can designate these projects. It can also specify what in its opinion are local matters and say that no funds shall be available for these, or it can make lump sums available, specifying that Federal assistance shall not exceed a certain amount, percentage, or some relative fraction. The intermediate field is not so clear. Here, opinions may differ sharply. Perhaps the wisest course here is to

leave the matter for further investigation, or administrative determination, or both. Congress, however, should make clear the objectives of the program and the principles which, as a matter of policy, should be applied.

As to those projects where the line of demarcation between interests is not clear or where the interests cannot be measured, decisions as to divisions of cost might be made on the basis of relative financial capacities of the governments involved. In such cases ability to meet portions of the cost of capital improvements may be easier to estimate than relative benefits, which by hypothesis were assumed almost insuperable in this class of instances. Where benefit as a criterion breaks down or where it cannot be applied, divisions of cost can with substantial equity, it would seem, be worked out on the basis of ability to pay. If benefits, too, exceed taxable capacities, the latter would seem to be the ultimate determinant of the costs any particular government could assume.

Recoupment

The construction of dams, highways, bridges, school houses, sidewalks, or almost any other public work, for example, confers special benefits upon people living in given regions or owning property nearby or adjacent to such improvements. It is these nonuniversal gains which determine whether projects are to be characterized as regional, national, State, or local in character. Moreover, there are similar special advantages conferred upon fortunately situated individuals by the construction of many of these projects. Special advantages from ordinary public activities are usually windfalls. Similarly, gains from the construction of public improvements are sometimes made the occasion for special assessments, particularly in the field of municipal government. It is perhaps fitting that the Federal Government should be allowed to recoup a portion or all of the benefits locally conferred by its improvement project.[49] These benefits accrue to individuals and not to State and local governments. If these recoupments are to be made, special charges in the nature of special assessments must be imposed. Their imposition may require the creation of special districts whose boundaries coincide with no existing political subdivision. The development of techniques by which the benefits so conferred may be approximately measured will also be required. It is in the measurement of these benefits that special assessment and recoupment projects meet their greatest difficulty. Even the stabilization of economic activities and of property values may complicate this problem.

If the attempt is made to measure benefits before they accrue the computations seldom result in the imposition of charges closely approximating the benefits conferred. The annals of municipal finance are full of examples of special assessments that have gone awry. Seldom have the estimators been able accurately to approximate benefits conferred. Sometimes they have erred on the side of asking too little; on occasions too numerous to mention the costs imposed have been far too great. If the attempt is made to postpone the levying of the assessment until such time as the benefit accrues, there is little doubt but that the probability of a future assessment would be so discounted that property values would not reflect the benefits conferred on improvement projects. Thus, the possibility of recouping special advantages from public works by imposing either special assessments or land-increment taxes is limited. The benefits may possibly be reached through additions to income, but in many cases this would involve imputation of hypothetical income instead of the calculation of gains currently realized. In fairness it would require, too, the development of a differential income levy involving many additional complications. In spite of these practical difficulties the ethics of recoupment cannot be questioned.

So far no adequate measure of these specialized benefits has been developed. Whether satisfactory techniques to approximate them can be evolved will depend upon subsequent research. It is too soon, indeed, in the case of many improvement projects to determine the advantages conferred, on the one hand, and the disadvantages and losses elsewhere reflected on the other. Gains to one area are frequently economic losses to others. Where charges for special benefit are justified compensation for damages is equally deserving, but neither can be accomplished save only in rare cases by the division of costs for public works among units of government. What is required is the development of special charges by the operative authority and the imposition of recoupments upon individual beneficiaries and property owners.

Territorial Aspects of Tax Problem

Those who are wont to ignore the direct and secondary effects flowing from an economic stabilization program involving the construction of vast public works sometimes point out that if the taxes ultimately levied to defray the cost of such a program must be nationally uniform, certain areas within the Nation may not be taxed in proportion to the economic enhancements or gains received from the construction program. Certain areas may be taxed that are not benefited by the improvement constructed (save as stabilization benefits are conferred) whereas areas receiving direct benefits from the capital outlay per se may be allowed to escape. This view, of course, overlooks the primary

[49] The same reasoning would apply to other governments.

reason for undertaking a cyclical public-works program. It is similar to the complaint arising from centers of wealth that the bulk of Federal taxes are there collected and exceed the expenditure of Federal funds in such territories. This is the direct consequence of the development of a tax system based upon criteria of ability to pay. It is the present aim of fiscal authorities to collect funds from citizens in regions most able to contribute to the support of government and to spend those funds in the pursuit of national interests where they will accomplish the greatest good for the Nation as a whole. Objections to this policy are both provincial and unsound. To a greater or less degree they are involved in every expenditure of government. They indicate the futility of assuming that those who actually pay taxes truly bear them, or that the regions in which funds are spent reap all of the benefits from such expenditure. The continued recurrence of these objections perhaps indicates the futility of State-by-State comparisons and the maintenance of these units as proper areas for the administration of fiscal statutes or even the collection of statistics. They indicate, too, that if costs are to be divided in connection with public works the division should be made within territories and regions having some proximate relationship to the projects for which costs are being apportioned and should not blindly correspond to State and local political subdivision boundaries merely because for other purposes these regions happen to exist. If costs are to be assessed, it seems reasonable to believe that different projects may well require the establishment of special areas or regions for the division of costs. If the problem of the division of costs is viewed simply as the problem of what groups should be taxed to pay for public works, the case for the creation of special cost areas seems obvious once it is decided that some division should be made.

The creation of special districts within which the cost of construction shall be divided is particularly appropriate in the case of dams, flood control, stream pollution, hydroelectric generation and transmission, and perhaps irrigation, for many such projects affect portions of several States and sometimes foreign countries. The primary benefits from these projects do not seem to conform to existing political boundary lines. The benefits from flood control and stream pollution, for example, follow water courses and drainage basins. The gains from interstate bridges extend along the arteries of transportation. Hydroelectric gains extend from dam sites and reservoirs to the outlets for current. Different benefit areas result from different types of projects. Greater equity in the distribution of tax burdens might be achieved if special taxes were employed within these areas than if similar taxes were used by customary political subdivisions. In the interest of equity a vast increase in ad hoc governments would thus be required. This would lead to decentralized administrative authority and the decrease in financial control. Unless a full complement of fiscal officers was created for these districts they would have to depend on other governmental officers to collect and remit their imposts. This duplication and divided responsibility would but duplicate the chaos and delinquency now typical of special-assessment financing. It would involve a cumulation of tax rates and debts over which citizens would have little effective control. The Federal Government would gain little in terms of effective cooperation by dealing with such districts.

If such districts were created to enable the National Government to recoup costs from those specially benefited more could be said for the device provided it were done under Federal supervision or control, without reliance upon the officials or the legal machinery of other governments. It is doubtful, however, if public opinion would, at this time, sanction the creation of Federal assessment districts. If such districts were created they could only get the taxing power from States; the Federal Government is incompetent to confer it. In some cases the States can by law create municipal corporations which could be given adequate taxing and borrowing powers to finance the desired improvement. But in case the project involved two or more States compacts would have to be entered into. Such is the arrangement under which the Port Authority of New York operates. It is authorized to borrow money and repay its debts from earnings. The question still remains as to whether districts created by compacts can be given the taxing power. Such doubts can always be settled by constitutional amendment. It is noteworthy, however, that such districts can be created only by State and not by Federal action. Here again the voluntary cooperation with States would contribute much towards the development of an equitable set-up for the division of public works costs. In the planning of future works the creation of a limited number of special districts might well be considered. Their applicability to a large number of projects is doubted.

Are Governments Benefited by Public Works?

It is sometimes argued that State and local governments themselves benefit from the construction of federally paid public-works projects and that, therefore, they should be called upon to defray a portion of these costs.[50] The benefits to these governments are seen in the fact that Federal participation eases their finan-

[50] Cf. pp. 16–17, *supra*.

cial problems, that the public-works program provides them with capital which sooner or later they might have to provide for themselves. When the Federal Government builds a needed bridge, repairs a street, constructs a school, builds a court house, or provides any other needed municipal improvement, it is argued that funds which otherwise might have been used for these purposes are freed for other uses. These are visioned as direct benefits to the governments in question. The real beneficiaries, however, are the citizens. It is difficult to see how the alleged relief of financial responsibilities can be made the basis for the imposition of costs for public works. If funds actually are released, they may be devoted to other purposes and thus the aggregate of public spending may be either increased or maintained. If the latter, the objective of the public-works program has been attained. If, however, the Federal construction or financing of public works enables other governmental units either to curtail their aggregate expenditures or to decrease the amount of taxes levied, there may be reason to doubt the efficacy of the Federal policy from a stabilization point of view. If total expenditures, however, are maintained the Federal contribution in the public-works program will represent a needed addition to the purchasing power, assuming that this purchasing power has not been contracted by the Federal methods of providing funds. If total expenditures are cut when the Federal Government pays the entire public-works bill, so much is the economic stabilization loss. In such cases a division of costs may well be undertaken to avoid this consequence. Here again an eclectic administrative policy is called for, as the economic consequences of maintaining total expenditures must be balanced against the tendencies generated by the financial methods pursued in maintaining the aggregate. If the total can be maintained only by the imposition of economically unwise State and local taxes, a different situation is created than if Federal financing leads to a net addition to aggregate spending. In the future the reasons for ill-advised taxes imposed by subordinate units should be avoided.

If public-works projects can be secured by State and/or local governments only on condition that Federal grants are matched or supplemented by State-local funds the lure of grants may lead to unwise diversions of public funds in cases where aggregate expenditures are not increased. The clamor for public work, particularly if it means jobs for unemployed labor, may be so great as to cause curtailments in ordinary services in order that funds may be saved to match Federal grants. Not only does this policy prevent an increase in aggregate expenditures but the losses inflicted on citizens through curtailed services may in the long run be as serious or even more serious than foregoing Federal grants for public works. Moreover, the lure of grants for a designated purpose may interfere with the allocation of public funds by receiving governments to the end that the most essential needs of communities in the marginal sense may not be properly supplied. This consequence of a policy of dividing public-works costs must also be minimized, if, indeed, it cannot be avoided.

These dangers would seem to be minimized if the various governments plan their stabilization programs in advance and as a cooperative enterprise. Grants offered by the central government may, indeed, appear as a lure to unwise local or State expenditure—a condition founded upon the assumption that the project is underwritten more in the Federal interest than in that of the subordinate government. Likewise, sharing costs via grants gives State-local governments nothing to say about the terms or conditions upon which they are offered. They resemble bounties dropped from above. The subordinate governments are free to accept them as they like. If, however, subordinate units cooperate in the development of the public-works-construction programs, projects will doubtless be evolved in which they have substantial interests. The greater their interest the greater the likelihood that the financial burdens assumed will be maximized. If in cooperative fashion cost details can be developed, many of the undesired tendencies just referred to above may be avoided.

Administrative Reasons for Sharing Costs

Some administrators argue that unless State and local governments are required to meet a portion of the costs of public works the funds allocated will not be economically spent. It is urged by proponents of this view that State and local units will tend to favor the construction of unnecessary improvements, or even wasteful projects, so long as the Federal Government is footing the bill. This tendency is assumed to be inversely proportional to the costs borne by subordinate governments. Moreover, if some of the administrative duties in connection with planning, construction, or operation of improvement projects are performed by units of government other than those carrying a portion of the financial burden of their construction, these duties, it is believed, will not be efficiently performed in the absence of a financial stake in the enterprise.

These notions rest upon the assumption that the only effective way to get either efficient expenditure of funds or adequate administration of public-works projects is by imposing financial costs upon all units of government engaged in the administration of public-

works projects. Therefore, so long as the Federal Government in its public-works program makes use of State and local agencies either in the planning or execution of the public-works program, adherents of this point of view insist upon the imposition of financial burdens in order to secure efficient, economical cooperation, and administration of construction projects. Perhaps such advances have been made in the science of administration in the last decade and in the development of professional standards and techniques by those engaged in this work that as a general proposition there may be reason to doubt if the financial obligation is the only effective incentive to proper cooperation, supervision, and execution of public-works projects.

Such arguments overlook the many administrative aids available to secure the effective discharge of this work. The science of accounting has contributed its records and audits to guide the administrator; statisticians have provided methods by which the standards of performance as well as the need for public works may be intelligently measured. The opportunity for Federal inspection, approval, and stoppage of funds in case of abuse have apparently been overlooked. This is, of course, "red tape" and "bureaucracy." These may pass beyond the limits of intelligent control. Their extensive use may even hamper the execution of programs so that the imposition or assumption of financial burdens by subordinate governments may be preferred by them to the red tape involved in any other course. Perhaps the price of freedom from red tape is the assumption of a portion of the public works costs. If, however, effective administration cannot be secured in the absence of the imposition of financial burdens, then the problem becomes one merely of imposing costs sufficient to secure the desired standard of administrative performance. No general rule can be stated as to the precise contribution necessary to accomplish this, nor can it be assumed that a sum required in one locality would be sufficient in another, nor that the costs imposed in the case of one project should be adopted for others.

These arguments, too, overlook the possibility of the direct assumption of certain parts of the emergency public-works program as a function of the Federal Government. Indeed, the National Government requires the construction of many capital improvements to carry on normal as well as emergency functions. Such projects would not only be financed by the Federal unit, but would be carried out by Federal agencies and employees. A good case can be developed for a Federal public-works program in depression periods, either alone or in conjunction with programs involving other governments. The latter, however, present greater possibilities for reemployment, due to their greater potential volume. Sound judgment would seem to require both types of programs. The plan followed during the recent depression, moreover, has been one of Federal-State-local cooperation involving some measure of contribution by these subordinate units with varying degrees of Federal supervision. Simultaneously, too, Federally financed and Federally executed programs of national interest were undertaken. Whether the cooperative type of organization produced as good or better results than might have been secured from a purely Federal emergency program is only open to conjecture. The results, limitations, and accomplishments of each form of administration should be evaluated before a permanent stabilization policy directed toward the next depression is formulated, in order that the most efficient administrative system and the most equitable division of costs may be provided for the public works program. Such an inquiry should probably be made by independent scholars in order to assure an impartial appraisal of the program pursued. It should be made by individuals in whom both the Government and outsiders have confidence. It should be both critical and constructive else it would be of little value in the determination of future policies.

Possible Bases for Division of Costs

In spite of the many difficulties involved in the division of costs, comprehensive future programs of public works cannot be prepared unless such divisions are to be made. It is therefore desirable to examine the tentative bases with reference to which divisions of costs may be effected. Among the possible standards are the following:

1. Division on the basis of governmental functions.
2. Division in proportion to relative benefits.
3. Assignment of costs on a population or per capita basis.
4. Division on the basis of fixed percentage contributions.
5. Division of costs on the basis of relative wealth and income.
6. Divisions by formulae designed to accomplish special purposes.
7. Assignment of costs on the basis of administrative determinations.

1. Functional Divisions

The attempt to assign costs of public works projects on the basis of governmental functions, or the attempt to assign the cost and underwriting of particular public works to specific units of government on the basis of governmental functions performed by them would be both inexpedient and unworkable, even though the constitutional framework creating the American system of governments contains some allocations of gov-

ernmental functions. Aside from those pertaining to national defense and the regulation of trade and commerce, no clear-cut divisions of authority have been set up. With reservations of power to States the delegation of specific powers to the central government and the performance of functions implied in the constitutional framework have changed in character both with the passage of time and the rigor or liberality of judicial interpretations of constitutional law. Even within this framework rigid definition and adherence to functions is impossible. Even national defense, while predominantly Federal, is by no means a national monopoly if State-local financial contributions are considered. Protection of persons and property is performed by almost every unit of government; central, State, and local governments, all in varying degrees, regulate trade and commerce; health and the general welfare are promoted by all; recreational facilities are provided by nearly every unit of government. Moreover, the locus of numerous functions has been subject to continuous change. Functions once local are now performed by State and Federal units. Roads once a local matter now concern the Nation and the States. Education was originally a local function; now all levels of government have an interest in it. The same is true of poor relief. The national agency is as continuously encroaching upon the traditional sphere of State activities as State agencies have been invading the realm of local services. The distribution or allocation of public functions is in continuous change. These changes have taken place in response to popular demand and in accordance with changes in economic and social life and in conformity to the evolution of our standards and ideals of governmental service. In last analysis, governments will do whatever the citizens demand. These demands have been increasing in most levels of government. Whose obligation, then, is the performance of any particular function, or the development of any particular program of public works?

The obligation ultimately must fall upon that unit best able to serve the needs of individuals composing the State. In some cases it will be one set of governments, in other instances different units. The allocation of functional responsibility does not rest upon ability independently to finance particular functions, for the collection of revenues may be regarded as a function to be allocated on the basis of efficiency in performance the same as any other activity. Revenues should be raised, then, by that unit best able to discharge this task. The revenues so collected can and should be allocated for expenditure to those agencies able most efficiently and economically to satisfy collective wants. It may be expected, however, that if the grantor is a central government conditions may be imposed on the use of such funds. The greater the contribution of the grantor the greater the probable degree of administrative supervision imposed. This seems to accord with human traits. Nevertheless, one government should not attempt to exact payment from another unit merely because it takes over the performance of a function hitherto performed by another agency. Nor should one government compensate another for performing services to the citizens of the latter, especially under a federal system, when the service is performed presumably for the same group and when the citizens of the minor agencies are also the citizens of the central unit. Presumably transfers of functions take place on the basis of efficiency and involve the surrender of no vested rights requiring compensation.

The propriety of dividing costs for public works among units of government rests upon considerations of the incidence of particular taxes in relation to the incidence of benefits for public works and also upon the degree to which the revenue function is lodged with independent agencies. Of course, advances by one government on behalf of another may necessitate financial adjustments. Likewise, the cooperative action of several units may justify the joint assumption or division of costs. The most that can be said is that while divisions of cost on the basis of governmental powers (functions) is illogical, some general divisions can be made on the basis of governmental interests or benefits to territories and groups within them. Such a proposal has already been advanced.

It need hardly be said that transfers of governmental functions, including responsibility for public works, should not be attempted in order to shift appropriate tax burdens from one group to another unless the transfer is made to increase the equity of the resulting taxation. In attempting to analyze the problem of division of costs by governmental units, the incidence of taxation is obscured. Transfers of functions and assignments of public works costs may inappropriately shift tax burdens. In a general way the attempt is sometimes made to localize territorially both the burden of taxes and the benefits of government action. It is frequently asserted that only those territories benefitted by government action should be called upon to defray the costs of government. If these benefits must be measured, difficulties at once ensue. Yet as an ethical concept it furnishes a fundamental basis for jurisdictional fiscal policy. It means that national resources should be used for national ends. Local taxpayers should pay for local improvements. This canon casts no light on what is national or local—that is a question of fact. It aims to prevent those receiving no benefits from subsidizing those who do.

Extraterritorial taxation is not, of course, unknown. The residents of many territories are frequently called upon to defray the cost of governmental activity in other territories, or services the benefits of which accrue primarily to nonresidents or the citizens of other territories, but such expenditures are only tolerable if they promote the interests of the citizens of the government making the appropriation. Highway expenditures frequently are of more benefit to nonresidents than to residents, particularly where the roads are devoted to the movement of interstate traffic. Traffic arteries between Philadelphia and New York, for example, have imposed heavy burdens on New Jersey taxpayers. Certain roads in northern Indiana carry more Illinois and Michigan vehicles than native cars. Had it not been for Federal grants these highways might still be inadequate for traffic demands. Both New Jersey and Indiana hope eventually to recoup a substantial portion of their costs through the sale of taxed gasoline and the imposition of taxes on commercial vehicles traversing regular routes. Citizens of these States are expected to secure compensating increases in trade from the augmented traffic due to these improvements. Whether these hopes are realized is a question of fact; nevertheless, Indiana and New Jersey attempted to act so as to maximize the ultimate economic interests of their citizens.

In the case of public works, material gains accrue to particular groups from the projects themselves. Sidewalks are for the primary benefit of the people who walk on them, perhaps abutting property is also benefited, but national gains from such projects are hard to visualize unless the indirect contribution to reemployment is such a gain. There is little doubt but that each local improvement properly financed and timed assists in national recovery, but are these benefits of sufficient weight to justify the payment of a portion of the costs by the Federal Government? To argue that the National Government should pay such bills is to ignore other interests served by the construction project. The benefits of the improvement would be felt locally for many years; the stabilization advantage will soon pass. In the interest of economic recovery the Federal Government may properly bear a portion of the costs of local improvements in the midst of sudden depression for which advance planning was impossible, but there seems to be an insufficient basis for any assumption of costs for purely local projects in plans relating to future depressions. The Nation will have discharged its obligation if it makes loans or furnishes engineering assistance for the construction of such projects. If it is liberal it may indulge in stimulation grants during emergencies.

If particular improvements, though undertaken piecemeal, are to be made general throughout the country before the public-works program is completed, there may be little reason either for the recoupment of special benefits or for the division of costs among units where construction first takes place. Undoubtedly those first served get the greatest advantage from public-works improvements, but this can hardly be avoided as simultaneous construction, if not impossible, is at least generally uneconomical. As given improvements are spread over the country the differential advantages going to those first served tend to disappear. Moreover, as the needs of the country differ, and as a comprehensive public-works program gradually covers the Nation the need for special and localized charges to supplement those federally assumed gradually disappears. While this may be true of direct expenditures it does not appear to follow if instead of engaging in construction on its own account, the Government promotes the improvement by the use of grants. The problem may be illustrated in connection with the building of public roads. If the Federal Government itself constructs roads only in mountainous States, other commonwealths will in effect be paying the cost of these improvements. They may feel justified in insisting that the mountain States should contribute substantially toward the construction of such roads. If, however, roads are to be built by the Federal Government through all of the States, the benefits of this policy will become generalized among the citizens of the Nation. There will be little ground for complaint if the costs are met by national taxation. Similarly, if roads are most urgently needed in one locality whereas bridges, flood control, water-conservancy projects, grade-crossing elimination, or other improvements are most urgently needed in others, the benefits from one type of improvement in one State may be offset by other types of improvements in other States.

The system of priorities in construction activities proposed by the National Resources Committee is an attempt to decide what things should first be done in the national development program. The roads constructed in one State may find their counterpart in a forest enterprise or flood-control plan in another. National as well as lesser requirements are weighed both in deciding upon the projects suitable for particular regions and in determining which projects should come first. So, too, the interests of governmental groups in the fiscal aspects of the programs may be evaluated.

2. Apportionment on the Basis of Benefit

It is frequently argued that the costs of public works should be divided on the basis of benefits conferred. Indeed, it has previously been suggested that gov-

ernments could appropriately assume costs only to the extent of their interests. These interests in turn were thought to have some rough relation to the incidence of direct benefits from governmental service and public improvements. The difficulties in measuring benefits and the intangible character of many of them have made the benefit doctrine more of an ethical concept than either an economic principle or a tenet of political science.

Two types of benefits from public works have been distinguished: The primary gains from the improvements per se, as reflected in the satisfaction of wants; the secondary effects cover economic stimulation, reemployment, and similar tendencies. The measurement of the primary benefits is far easier than the estimation of secondary effects, though approximations in each field are none too reliable. Up to the present time the primary benefits alone have been used in the division of costs among governments. Now it is sometimes queried whether the secondary benefits may be substantial enough to warrant the assumption of the public-works burden in depression periods by the National Government. Emergencies severe enough to create widespread and unprecedented unemployment may be conceived of where economic rehabilitation should be undertaken regardless of the cost, but in planning fiscal policies for the future it is doubtful if an effective or economical[51] program could be built on the assumption that the Federal Government would pay all of the costs. Of course, if the only projects undertaken were those involving purely national interests such a cost policy would be proper. For them, Federal financing is recommended. Yet it is doubtful if a sufficient volume of Federal projects territorially diversified could be secured to produce the desired economic stimulation. If, then, the public-works program is to comprehend projects in which the primary Federal interests are limited, justice would seem to require cooperative financing. This would tend to improve the execution of plans by subordinate agencies, protect taxpayers from the consequences of waste and lessen the pressure of vested interests promoting given types of projects. Protection against such developments is essential in programs designed for future use. In emergencies some of these conditions do not develop, others appear so regularly as to make provision against them an essential of a well-planned future policy. It is doubtful, therefore, if secondary gains—reemployment, reflation, etc.—can be used to cast increased burdens on the Central Government in plans now being developed for the future. Some of the conditions creating an emergency and thus calling for Federal assumption of the public-works costs to the degree involved in the recent crisis should be removed before the next depression.

There is one respect in which it is erroneous to discuss benefits to particular governments. The real beneficiaries of public works are the citizens served.[52] Seldom do the benefits diffuse themselves equally among this group. Whether individual benefits are a proper basis for charges may well be doubted but certain it is that these gains can seldom be reached by charges imposed by the Federal Government on State and local agencies even though the latter in turn are allowed to divide the costs among their citizens. If benefit is to be made the basis of assessment rather than ability to pay, recoupment charges or special assessments federally imposed may need to be made. But general benefits cannot be reached through special assessments. If the costs are divided among State and local governments and their contributions in turn come from general revenues the incidence of these charges is not likely to be on those primarily benefited by public-works improvements, and if the charges are imposed upon them as a benefited group the individuals will probably not be taxed by State and local units either in proportion to their total ability or in proportion to benefits received. The feasibility and economic utility of such benefit assessments may well be doubted. Likewise, it is doubtful if general taxes have much relation to benefits from particular improvements.

To the extent that benefits are to be used as a divisor for public-works costs the task is one for the administrator, but Congress must be relied upon to fix the limits of the Federal interest. This may be done roughly by legislation fixing the type of improvements to be undertaken. Separate apportionments, however, seem to be required for each type of project. General rules can scarcely be laid down in view of the unequal incidence of advantages. The construction of a dam or an irrigation project may, for example, increase land values over a wide area, even opening new regions to colonization or converting submarginal territories to profitable productive lands. Flood control may reduce the losses and add to the net incomes of a population flung along river valleys. Reforestation may conserve soil, minimize floods, provide recreational centers and eventually provide an increased supply of lumber. Motor highways may care for the needs of a motorized population for both recreation and commercial purposes; they may increase farm values by facilitating the transportation of agricultural products, or contribute to the upbuilding of manufacturing centers connected with the automotive industry or service institutions along their routes. Only a few of the

[51] That is, one where productive assets were built and the full worth of each dollar spent was returned. "Economical" is not here used in the niggardly sense.

[52] Cf. pp. 16–17, *supra*.

many benefits from these projects are here inventoried but their incidence is neither uniform nor universal.

Such projects as these affect both the national, local, and intermediate interests in ways other than reemployment or stabilization. Some division of financing is justified but no clear-cut method is known whereby the exact proportion to be borne by each can be determined. A few objective criteria can be found to aid in decisions, but their validity is not conclusive. For example, area may well be considered in connection with drainage projects; mileage and traffic are important in highway construction; acreage and water consumption may be appropriate in connection with irrigation projects. But what weight shall be given each factor? How much of the costs shall be Federal, State, or local? The answers in the end must be somewhat arbitrary and reflect the weight of individual opinions. The marginal contributions from subordinate units necessary to enable construction to be undertaken are not known and involve many variables. If decisions must be arbitrary the proper course seems to be to work them out cooperatively as a portion of the planning program. This may even turn out to be a compromise approach, or even a "horse-trading" policy, but any other course may lead to the inadequate consideration of the interests, needs, and financial abilities of subordinate units.

3. Apportionments According to Population

Relative population is not an acceptable basis for the division of costs for all types of public-works projects. It would mean the equivalent of financing the public-works program on the basis of poll taxes or the assignment of territorial cost quotas on the basis of per-capita averages for the Nation as a whole. The cost of some projects may be closely correlated with population; in other cases the relationship would be quite remote. The need and cost of housing projects, for example, is determined more by the density of population than by total population. Land values may be a more important factor to consider in relation to cost than the population to be served, although land values, in turn, are closely related to urban population. While highway facilities may be indicated roughly by population, traffic density appears to be relatively more important. One of the primary advantages of an apportionment rule based on population is that it is simple and has been frequently applied to congressional grants.[53] Moreover, it corresponds with the basis of political apportionment and for that reason is often deemed to be acceptable. Yet per-capita distributions as applied to public-works costs would be quite arbitrary and would have little relationship to actual outlays if a national program were to be undertaken. They would show little correspondence with the benefits conferred.

The assignment of costs on a per-capita basis should not be confused with the extension of grants on a population or per-capita basis. The purposes of the two plans are probably not identical. Grants may be used either to encourage local activities, to equalize services or costs, or to secure indirect control over the activities of subordinate governments. The division of costs of public work may have these ends in view or the objective may simply be the development of a scheme for sharing the costs involved.[54] At this point it will be assumed that the last-mentioned purpose is the aim of the division of costs of public works. A Federal program might involve the assignment of money to the States on the basis of relative population but this would probably little correspond with needs in the various States. If selected projects receive congressional support some of them might be divided among the States on a population basis. This frequently tends to increase the grants to States with little wealth over what they might receive by the application of other formulae. At the same time the more populous States may be too liberally supplied with funds relative to their needs. Nine States, for example, contained about one-half of the population of the Nation at the last census.[55]

State:	*Population*
California	5, 677, 251
Illinois	7, 630, 654
Massachusetts	4, 249, 614
Michigan	4, 842, 325
New Jersey	4, 041, 334
New York	12, 588, 066
Ohio	6, 646, 697
Pennsylvania	9, 631, 350
Texas	5, 824, 715
Total	61, 132, 006

4. Percentage Apportionments

Another method available for apportioning the cost of public works among the various governmental units is assignment on the basis of fixed percentages. This is ordinarily referred to as the "matched grant." The central agency agrees to pay a certain percentage of the cost of given projects if the balance required is furnished by other governments. The table following gives the matching requirements of current Federal grants, so far as they are definitely specified.[56]

[53] See appendix A.

[54] The encouragement of public works is discussed, pp. 122 ff., *infra*.

[55] Fifteenth Census of the United States: 1930, vol. I, population, p. 10.

[56] For further details see Appendix A.

Purpose of Grant:	Federal contribution (percent)
Aid to dependent children	33⅓
Homes for disabled soldiers and sailors	50
Agricultural research	50
Dairy and livestock experiments	50
Agricultural extension work	50
Forest fire protection	50
Forest planting stock	50
Highways	50
Vocational education	50
Vocational rehabilitation	50
Maternal and child welfare	50
Crippled children	50
Old age assistance	50
State marine schools	50

This method of dividing costs is both simple and arbitrary. So far as it is designed to encourage activities on the part of subordinate units the Federal contribution need only be large enough to bring forth the desired amount of State-local expenditures. With fixed expenditures equalization of costs or services is hardly possible. The merit in this method seems to consist in its widespread use and in the expediency of being able to assert that the Federal agency will spend as much on selected projects as the States are willing to appropriate. The psychological reaction to this formula is doubtless to stimulate expenditure. This may easily lead subordinate units to assume burdens for ill-advised projects or to adopt unwise financial methods simply to get Federal funds. It may be objected to on the additional grounds that a dollar of Federal funds "purchases" control over twice that amount in public expenditures.

As a means of stimulating public works, percentage grants might be employed; as a method of dividing costs it seems to be much too arbitrary. Of course, if the percentages were made to vary in accordance with the importance of projects or the estimated value of improvements to different governments more could be said for their application to public works. The danger, of course, is that legislative precedents may be too hard to overcome, and the 50-50 division may be accorded some magical significance. The reasons of expediency advanced in favor of percentage divisions are hard to overcome, yet a logical basis for their continuance is equally difficult to discover. If a better basis for apportionment cannot be evolved the precise percentage contributions should be fixed by the joint action of all participating units.

5. Apportionments according to Income and Wealth

Another suggested criterion for dividing the costs of public-works projects among State and local units of government, after the National Government has fixed its share, is on the basis of territorial wealth and income. These standards appeal to one as being in conformity with principles of ability to pay. Taxes imposed upon these bases, properly applied, conform to prevalent notions of equity. The Federal tax system, with its progressive income and estate tax, leans properly in this direction. It is with revenues from such ability taxes that it is hoped that the public debt and the current expenses of government will be largely paid. While it is proper to develop a fiscal system primarily dependent upon these two tax bases, it does not follow that the cost of public works should be apportioned among the States on the basis of these criteria. Estimates of national wealth and income are today much more accurate than similar approximations for subordinate governments. As a matter of fact, the errors in estimates tend to increase as the territories decrease in size. The localization of wealth and income is a difficult task. So widespread is economic activity that the income reported from commercial and financial centers is seldom all earned there. Corporations, for example, report from their main offices, yet their operations may extend over the entire country. Individual income returns, too, include many receipts from territories other than that of the domicile. Not a little income is international in its origin. It is difficult, therefore, to fix a *situs* for income.

Estimates of wealth present similar difficulties. In many cases the estimates themselves are less reliable than those of income. Frequently property tax assessments, which contain wide margins of error and omissions, form the basis for many approximations. The counting of incomes, too, appears to be an easier task than that of appraising the value of taxable assets comprising the bulk of our National wealth. More attention has also been given to problems of estimating income than to those concerning wealth. Many of the problems, nevertheless, are similar and the task of localizing property values is little different from those connected with income. The worth of urban property depends not alone on the presence and activities of people in cities, but upon the trade and intercourse with the hinterland and more remote areas. Property values in New York or Chicago, for example, may be due in part to the trade of Kansas City with Omaha, to the business done by Iowa farmers with Chicago merchants, to the loans of New Jersey insurance companies to the railways of the west, or to the desire of Cleveland residents for foreign goods shipped to New York importers. Such activities, of course, indicate a concentration of resources available for taxation both by National, State and, perhaps, local units. Whatever costs for public works are to be assumed it is hoped the burdens shall be imposed in close relationship to the ability factors.

It is difficult to believe, however, that plans for future public works can be developed on the assumption that costs can be divided in proportion to localized income and/or wealth unless the funds are spent in the territories where these apportionments apply. The Federal Government can raise money through taxation on the ability principle and spend it where services or outlays are most needed but it cannot distribute costs among subordinate units on an ability basis unless expenditures flow with the funds. Few subordinate units, if any, would assume such loads unless they were receiving in benefits more than they were paying in taxes. They would be taxing their citizens in order to pay for improvements outside of their territorial jurisdiction. Nevertheless, where other bases of apportionment cannot be applied, the division of costs on the basis of these ability factors may be justified. The results of such apportionments may also be quite equitable. In last analysis, too, wealth and income determine the ability of individuals (and particular territories) to stand the impact of taxation for public works or other purposes.

6. Other Methods of Apportionment

The limitations on the applicability of the previously discussed bases of apportionment indicate that better results, perhaps, could be secured by the development of special-purpose formulae. So diverse are public-works projects that general rules soon lose their validity when applied to concrete cases. Moreover, single-factor apportionments usually are so simple and arbitrary that they do not maximize the objectives sought by the legislation under which they are applied. What is called for is an eclectic policy with appropriate factors—several of them preferably—incorporated in the cost allocations. In the case of highways, grants are now based on rural and star-route mileage, area, and population.[57] Allocations for the cost of highway projects in a public-works program might, for example, appropriately give some weight to costs of construction, traffic density both in terms of number of vehicles and ton-miles of travel, and perhaps the character of vehicles using the improvement. Allocations for housing projects might take into accounting not only the number, character, and density of population, but also land values, rentals, available housing, income status of population, cost of project, and other items. The precise combinations will have to be developed by careful research.

Other factors to consider.—Indeed before any allocations can be decided upon there must be a decision as to the functions and responsibilities of the various governments. This is essential to the development of future plans, not only as to what types of public works shall be undertaken but also as to the degree of participation in financial burdens. It can hardly be decided by the Federal Government alone unless its program is to be prosecuted without State-local cooperation or unless the division of costs is to be accomplished only by way of grants. If the latter, the grant must be large enough to purchase the desired conduct from subordinate governments. This is in no real sense a division of costs. It is a statement of terms on which Federal subventions are available. Cooperation between all units appears to hold promise of better results. In order to implement such action, conferences on policies to be pursued should be initiated by the National Government. The President could well afford to discuss the future of public works, their planning and financing with States and important local units, after which the development of a cooperative program could be undertaken through the leadership of the appropriate administrative agency.

Such a development cannot neglect the consideration of a national revenue policy. If proper plans are to be made for future governmental activities, the fiscal systems of the Nation need to be more closely articulated.[58]

An essential feature of these plans is the development of a policy covering the relations of the Federal Government with the States and other units, and the relations of States to their municipalities. In this field the present attitude of the central and intermediate governments is one of hyprocrisy and cynicism. The governmental machine instead of operating as a coordinated mechanism for the satisfaction of the needs of citizens operates as a series of unrelated parts revolving in many directions. The Nation has too few contacts with the States and even fewer with important municipalities.[59] Nor have steps been taken to overcome the difficulties to more effective cooperation. Whether the National Government should have dealings directly with local units has been almost a question of diplomatic properties. Many Federal departments have, therefore, maintained no direct relationships with cities and some States have attempted to thwart such developments. During the depression some of the barriers were pierced when States attempted to prevent Federal assistance to the unemployed or when they procrastinated unduly. The overshadowing importance of municipal and National Government has meant little. By tradition the States and the national unit were components of the Federal

[57] See appendix A.

[58] See pp. 3–6, *supra*.

[59] None of the direct contacts antedates the late depression and those that have been effected are largely of an emergency character. Cf. activities of Reconstruction Finance Corporation, Federal Emergency Relief Administration, Works Progress Administration, and Public Works Administration.

system but the lack of cooperation between them, together with differences in constitutional powers, has meant that some problems can be solved by neither level of government, yet no joint action has been taken to overcome these developments or to improve the public services of common interests to each. Few States have joined with their neighbors in the solution of mutual problems though the compact clause of the constitution indicates what might be accomplished here. So far as future plans for public works are concerned, these avenues of approach offer interesting possibilities.

On the other hand, if attempts to divide costs of public works produce these tendencies they will thus minimize the economic benefits from the public-works policy. So carefully do all these factors need to be weighed and so carefully must the economic consequences of Federal, State, and local fiscal policies be considered that divisions of costs, if any, may better be left to administrative discretion and determination in particular cases than be made a matter of law.

7. Administrative Determination

Historically, efforts to solve cost allocation problems have been left almost exclusively to Congress. They have taken the form, first, of legislative log-rolling, then of statutory formulation and finally the transfer of increased responsibility to administrative agencies.[60] It has become increasingly clear that the formulae enacted into law to allocate appropriations for capital improvements, such as highways, or general services, such as vocational education, are largely arbitrary. In operation they tend to distribute funds so as to provide more facilities than are required in one area and not enough in others. The apportionments may not help to attain the objectives desired by Congress. The absence of principles to guide the legislative assembly has made them satisfied with makeshifts. During the depression, however, when funds had to be appropriated more in accordance with need the role of the administrative agencies in apportioning grants was greatly extended. The emergency relief grant of May 1933 gave the Federal administration power to apportion funds among the States with the restriction that not more than 15 percent of the total should go to any one State.[61] The public works plan of the same year was allocable under Federal authority but required the States to raise all of the funds except 30 percent of costs of labor and materials.[62] The Social Security legislation of 1935 also gave administrative authorities wide discretionary powers.

The role of administrative officers in apportioning Federal grants under broad powers conferred by Congress is not new. In 1887, for example, the Secretary of Agriculture was authorized to pay the cost of certain research relating to agriculture for which a lump sum grant of $15,000 per State was provided. Some years later the Secretary was given some discretion in the determination of the ability of Alaska to make effective use of funds.[63] In 1911 he was authorized to enter into agreements for cooperative fire protection on such terms as he deemed wise but the amount spent was not to exceed the sum spent by each State for similar purposes. In 1924 the Secretary of Agriculture was given similar power for the production and dissemination of forest seeds and plants. In 1928 he was given broad powers in connection with experiments in dairying and livestock raising.[64] These precedents seem not to have been extended to other departments. They are exclusive rights of supervision, audit, and withholding of expenditures—necessary complements of a grant-in-aid policy.

Allocations by administrative bodies under methods allowing the exercise of discretion enable distributions to be more closely related to Congressional intent and to the equities in each situation than is possible under general formulae dependent largely upon population, fixed percentages, mileage, or similar factors. It will enable administrative agencies to base their findings on the recommendations of technically competent persons employed by them or called into consultation. Panels of expert consultants may be developed to work out detailed divisions of costs for particular projects. Statistical research as to possible methods of dividing costs should lead to the discovery of appropriate, as well as equitable, techniques for accomplishing this task. Only through some form of administrative determination can all of the elements in a complex economic, social, and political situation be carefully weighed.

An essential feature of such a procedure is the comprehensive development of national planning. Responsibility for the perfection of a public-works program suitable for stabilization purposes would devolve upon such an authority. The financial plan, in-

[60] Mr. Robert Whitten summarized these policies as follows: "Historical efforts to solve the increasingly complex cost-allocation problem have taken the three forms of log-rolling, statutory formula, and an emerging transfer of responsibility to administrative discretion on the advice of technicians. The method of log rolling has been exemplified more or less strongly in the annual river and harbor bills, while the best example of a statutory formula is that covering the distribution to the States of Federal funds for highways. The latter method is a distinct advance over the pork barrel technique, but is too inflexible for ready adaptation to varying conditions and to changing needs. The alternative is to provide administrative machinery for the allocation of costs on the basis of technical findings in each specific case." (Memorandum to National Resources Board, November 1935.)

[61] See Appendix A.

[62] Ibid.

[63] See ibid. for further details. The appropriation was increased to $30,000 per State in 1906. Benefits of the law were extended to Hawaii in 1928 and to Puerto Rico in 1931. The act was applied to Alaska in 1929 with the proviso noted above.

[64] Appropriation of $50,000 was authorized in 1927. A similar appropriation was authorized the following year.

cluding division of costs, if any, should be part and parcel of that program. It would have to be consistent with the whole stabilization program. Congress might well be called upon to approve the outlines of a long-range public-works program with annual and reserve appropriations for its prosecution, the annual appropriations being devoted to normal periods, the reserves available for emergencies.[65] The sums would be allocated tentatively by technicians on projects within the program and the cost allocations, if any, would be determined by a cooperative planning agency representing all governments, all subject to approval by a fiscal advisory committee to be created.

More concretely, provision should be made for the creation of a Federal public-works agency whose duty it would be to prepare a long-range public-works program suitable for normal periods, minor recessions, and major depressions. This plan should be developed in conjunction with subordinate governments, the Federal unit matching funds in order to stimulate and encourage this enterprise. A necessary portion of these plans would be the development of financial programs and the division of costs. These details, together with decisions as to timing, should be turned over for approval, rejection, or modification to a fiscal advisory committee composed of the President, the Secretary of the Treasury, the Director of the Budget, the Chairman of the Federal Reserve Board, and the Chairman of the National Resources Committee, perhaps in an advisory capacity. The staff of the committee should be headed by an outstanding professional economist. State and local governments might also be represented on this committee. To this body would be referred the most crucial questions with reference to public works. In order to assure harmony between the public-works plan and the general monetary policy of the Nation, a weighted vote on policies might be given to the Chairman of the Board of Governors of the Federal Reserve System. Even a veto might not always be inappropriate. The authority of this committee would tend to place the determination of public-works policy on an objective basis, thus freeing it from the dangers of error if such crucial decisions should be left to congressional determination. The approval of a fiscal advisory committee for the public-works program would also minimize the interests of the planning authorities and the separate departments of government in promoting their own works. With the planning authorities to initiate and perfect the program and with a fiscal advisory council to decide on the timing, approve the financial policies and the division of costs, a flexible and sound system of public works should be developed, if such a goal is possible.

All of the difficulties inherent in a public-works program cannot, however, be solved by turning the matter over to administrative authorities. It may be naive to assume that they can find principles and experts to guide them which are not available to congressional committees. Likewise there is the objection that the more that is turned over to the executive branch of Government—the administrative arm—the more bureaucratic that political institution becomes and the less responsive it is to the wishes of citizens and the subordinate units of government. Should this happen, Congress can strip the administrators of their chevrons and can itself reassume the delegated powers. No doubt it would be unwise to give administrative agencies complete power to decide what the public-works program should be, the types of projects selected and the details as to divisions of cost. This would leave to Congress only the initial authorization of a program and the determination of the maximum expenditure. No argument need be advanced against such a program. It is obviously unsatisfactory. At the other extreme congressional determination of all details is equally bad. Between these extremes seems to lie the proper path.

Congress should approve the policy of economic stabilization with public works as one of the instruments of control. It should define public works and set up the general policies to be followed, such as the payment of real wages, the inapplicability of a means test, use of machine methods, etc. It should specify the type of projects for which funds should be spent. If it desires it could fix definite categories of expenditure, but it would be wise in any case to provide a large reserve fund for administrative allocation. It is not desirable to impose too many restrictions but at the same time Congress should be specific enough in its grant of power to make clear the aims and objectives for the public works program. Some funds in any case should be available for financing demonstration projects and experiments. As has been suggested it should make annual, as well as reserve appropriations for public works, and authorize in advance the extension of credit in substantial amounts whenever the economic policy committee decides to start a public-works program.[66] It should fix the limits or framework within which those charged with the administration of the act could function. With these safeguards it is believed that the administrators should not run amuck.

The delegation of broad authority for the planning, execution, and financing of public works is an important step requiring considerable time for its proper consummation. Even after the administrative agen-

[65] Clark, Economics of Planning Public Works, pp. 78, 161 ff., especially, p. 165.

[66] See p. 119, *supra;* also Clark, Economics of Planning Public Works, pp. 78, 161 ff.

cies are created, considerable time should elapse before new policies as to divisions of cost should be announced. The research on which sound financial planning must rest cannot be produced overnight. Until proper changes can be made, the present system may have to be maintained for a few years. Meanwhile, the new plan could be started. In any case, however, the determination of the trend of public works—whether in the direction of expansion or contraction—could be determined by the fiscal advisory committee. This committee should be set up at once for with the return of prosperity, public-works expenditures should be drastically curtailed. Annual departmental expenditures for capital improvements should also be carefully scrutinized and judged with reference to a cyclical policy. Perhaps many of them should be drastically reduced as prosperity returns.

Encouragement of Public Works

Since one of the primary reasons for urging the division of costs of public works among the various units of government was to improve their administration and to promote their execution, other devices for accomplishing this should not be overlooked. Grants may be employed both in emergencies and in normal times to accomplish this result, though there is little difference between grants requiring matching of funds and the outright division of costs.[67] The same objectives may be accomplished by sharing the proceeds of given taxes, or by dividing a portion of certain tax bases with subordinate agencies. Surcharges may be permitted on centrally administered taxes in order to provide funds needed by subordinate agencies for public works or other purposes. All of these aids may be made conditional on the specified use of funds. It is the imposition of conditions which enables the aims of the grantor to be attained or attempted. Minor units may conceivably give financial assistance to superior governments but the possibilities of such practices while not unknown are limited. In the past where this has been done the systems have invariably broken down in operation.

Loans, as has been indicated,[68] may also be made to promote the development of a public-works program. The Central Government, too, might assume the burden of interest costs as its contribution to local undertakings just as through the consolidation of loan operations it might reduce borrowing costs by making its credit available to other agencies. The Central Government might, in extreme cases, guarantee the debts of subordinate units or provide discount facilities for their short-term loans. Even the establishment of a bank for public deposits and public loans, or the creation of a government credit corporation, or a branch of the treasury to make loans to governmental bodies might be used to assist in the financing of public works. These are possibilities which need to be studied as methods for implementing the public-works program and for facilitating the divisions of cost. European precedents in this field furnish stimulating illustrations for American investigation and consideration.

Numerous objections can be advanced to the development of a system whereby the Central Government would make loans to subordinate agencies. The early excesses of investment in the era of public improvements of the fore part of the eighteenth century, followed by a period of the repudiation of State and local debts may be cited as one of the dangers of such a system. Of course, the wild-cat banking of that period would be an argument against banking as it is done today. Dangers of abuse are generally possible in any undertaking involving human judgment. Allowing for this there would seem to be no reason that loans by a public agency to its subordinate units could not be made on the basis of acceptable standards of credit underwriting. Nevertheless, there is always the fear that a public agency might not be a harsh creditor and that the burden of unwise or political loans could be cast upon the Nation to a greater extent than if such operations were left to the judgment of private bankers. On the other hand, the need for public loans, particularly for public works, is greatest when bankers are least willing to extend credit so that the perverse elasticity of the present banking system may be a reason for the creation of a different arrangement as to public loans, particularly for emergency periods. If banks do not have to underwrite the loans of States and municipalities it may end what is referred to as "political banking", an arrangement seldom beneficial, in the long run, either to governments or banks.

Another objection of the loan of funds by central to subordinate governments is that such advances might give the superior government a degree of control over the finances and activities of subordinate units which could be regarded as interferences with their autonomy. The same objection is voiced against grants. The answer to this danger runs in terms of one's philosophy of government, notions of home rule, State sovereignty, and similar issues.

On the balance of all considerations, however, there is much in the loan policy to warrant its trial. As a means of assistance in the development of a public-works plan, particularly in depressions, it has much to commend it. An increase in loans might be a safe hedge against increased appropriations or augmented grants. It would be essential, however, to coordinate

[67] See pp. 64–70, *supra*.
[68] See pp. 59–63, *supra*.

the loan agency and its activities with the banking system of the Nation.[69] The entire subject warrants careful investigation.

Another method by which public works could be stimulated and a division of costs effected would be for the Federal Government to adopt a policy of reimbursement to subordinate governments for sums spent on approved public works. The additional requirement for construction within specified periods could also be added. The initiative in planning and construction would be volitional with State and local governments; the stimulus would be the possibility of being reimbursed for such expenditures. If lists of projects of the type eligible for reimbursement were published in advance the uncertainty of repayment could be minimized. There might always remain the difficulty of conforming to standards of construction prescribed by the Federal Government but these, too, could be made known in advance. Whether a policy of reimbursement (for total or fractions of costs) would operate as satisfactorily as grants is difficult to say. The grants would seem to stimulate construction more than a policy of reimbursements, because Federal funds would be available for expenditure as construction was undertaken whereas under the other policy such funds would not be received until after the completion of projects. If, however, State and local governments were forced to spend their own money, but with the probability of reimbursement, uneconomical and unnecessary construction would tend to be minimized. Likewise, the reimbursement policy offers an opportunity to minimize "red tape" and to increase the autonomy and initiative of subordinate governments. As a phase of cyclical planning for public works where preparations and policies are developed in advance the possibilities of this method of dividing costs might well be explored. Experiment would soon demonstrate its advantages and shortcomings.

Public-works construction may also be implemented through the loaning of technicians and scientific workers by the Federal Government to State and local agencies. Through such temporary transfers of personnel not only would the work of the initial planning of public-works enterprises be improved, but careful execution of plans could be assured. Competent professional assistance could thus be made available either at no cost to other governments or at very nominal rates. This would be particularly advantageous in the case of small units and small projects where public bodies could ill afford to employ highly skilled technicians at substantial rates of pay. The National Government could also make loans of machinery and tools to other governmental agencies. This would not only reduce the total cost of many projects but would also assure their construction by labor-saving and approved machine devices. So far as the planning of projects is concerned the Federal Government is now liberally assisting State planning agencies. This should be continued.

In some instances the National Government will not need to advance funds or make loans to encourage capital investment in enterprises tinged with public interest. The exercise of regulatory powers or the control of private associations and practices will suffice. Reduction in interest rates, decreases in public utility charges, the elimination of price disparities, the reduction of the cost of certain goods, or the equalization of competitive conditions may serve to attract private capital into fields which otherwise governments must undertake or into regions which otherwise may be undeveloped. For example, in the field of housing, the assurance of funds at low interest rates or the establishment of "attractive" prices for materials and labor may induce the necessary flow of capital to this field to reduce or perhaps partially relieve governments of their responsibility for the construction of such improvements. It is doubtful, however, if these inducements are sufficient to attract capital into the construction of proper housing facilities for wage earners or the low-income groups in the population, or even to provide all of the capital necessary for the optimum development of the economic resources of the Nation. To be sure, these measures will tend to stimulate investments in many fields, but public investments may continue to be both necessary and socially advantageous. The form of government participation will not always be the same.

It should be clear that the Federal Government has at its disposal many methods by which public works can be stimulated and the costs of construction divided. If preparations for the future are made in cooperative fashion and the subordinate agencies are given some voice in the program better results would seem to be possible and a fairer distribution of costs could doubtless be attained. The numerous financial alternatives available may be employed from time to time, and different ones may be applied to various types of improvements. It would not be necessary, therefore, to use grants in aid exclusively or to make the Federal Government solely responsible for the planning and execution of the future program.

In offering financial and other assistance to subordinate units of government for the construction of public works care must be exercised so that the assistance offered does not stabilize economic decadence, lead to wasteful methods of construction, or the building of relatively marginal improvements while more useful

[69] Cf. p. 59, *supra*.

projects remain untouched. Likewise, the initiative of subordinate governments to meet their own capital needs must not be impaired. The perpetuation of outmoded political structures through particular grants or aids should be avoided, by changing the form of the grants, by surrounding the proffered assistance with conditions concerning their use, or by other means. If these consequences of Federal assistance are properly visualized the grants and other aids may be so framed as to correct these very conditions. Federal assistance can easily be made an instrument of progress.

Program for Normal Times

The primary emphasis in developing a long-run program of public works, if economic stabilization is to be one of its aims, must be upon plans for depression periods. The program for normal times must be carefully dovetailed with that plan so that the two form a unified and consistent whole. The policies pursued by the Nation should be economically sound both in and out of depressions. The elastic program called for necessitates the expansion of improvements in depression and their contraction in normal times. This is necessary not only to conform to the stabilization program but also to make possible the retirement of debts or the accumulation of reserves in prosperous times. By speeding up the volume of improvements in depressions a relative surplus of outlays may be realized in normal times which in itself would tend to justify the curtailment of construction in other times. Nevertheless the complete suspension of construction of improvements in normal times is neither feasible as a practical matter nor sound from an economic point of view, nor possible from any standpoint.

Sufficient appropriations must be made annually to keep the Federal and State planning agencies in operation,[70] particularly so that these agencies may develop public-works programs available for prompt execution with the appearance of economic crises. Federal subsidies to States for this purpose should be provided. It is desirable, in addition, that the program in normal years should make adequate provision for conducting demonstration and experimental projects. This field should be left open for administrative determination not only as to the type of projects for demonstration and experiment but also as to the type of administrative arrangements and procedures employed and as to the division of costs, if any, to be pursued. If the Federal administrative agency is free to experiment in all fields, valuable conclusions in the development of permanent policies may be formulated. Among the activities to be classed as demonstration or experimental projects are the Tennessee Valley Authority, the housing activities of the Public Works Administration, the work of the Resettlement Administration, the soil-conservation projects, and similar undertakings. Even in the well-established functions and activities of the National Government, such as highways, flood control, and the like, there should be ample opportunity for experimentation and for the demonstration of new methods.

In addition to projects of this type normally undertaken, sufficient appropriations will probably be required annually to make possible the prosecution of a modest capital outlay program. This program should include provision for improvements required to keep pace with the minimum needs of a growing population, of increasing urbanization, or the growing congestion of city and rural traffic, together with the things needed to keep pace with the ever-increasing complexities of modern life. Construction to meet some of these needs can doubtless be anticipated and transferred to the emergency programs for minor or severe depressions as circumstances warrant. Some improvements, however, cannot be postponed. These should constitute the backbone of the normal program. They may be augmented by construction grants for the encouragement of projects of interest to the National Government. Normal periods seem to be the most propitious time for stimulating activities, but the stimulants should be cautiously applied else anti-stabilization consequences may be created. A wide range of projects may appropriately interest the National Government, but the financial assistance provided to encourage them should be only sufficient to secure the expenditure of necessary funds by governments accepting subventions. Too great liberality on the part of the Federal unit in subsidizing public-works construction in normal times should be avoided. The most pressing national problem in such times is debt repayment and the prevention of booms, both of which may be hampered by too liberal grants in aid. The time for liberality is rather in depressions.

Even the subordinate governments themselves should not be careless in formulating their own improvement programs. The type of cyclical planning discussed in this memorandum is applicable to them. They can alternately expand and contract their capital outlays within the limits allowed by the needs of their citizens. These requirements are flexible and some more accurate gages of their urgency need to be developed. It should be observed, however, that as advance provision is made for future needs the possibilities of postponement increase. The great danger in the local, as in the other fields of public activity, is that public works plans will be developed in normal times without integration into the long-run or cyclical plan. If, however, the planning authorities of these agencies cooperate with Federal officials in developing a cooperative plan the long-run objec-

[70] See Gayer, Public Works In Prosperity and Depression, p. 113.

tives will receive greater weight than if each government develops its own plan independently.

In order to plan intelligently for the future it is suggested that an impartial and disinterested survey be made to show the results of the capital improvement programs developed since 1930. The efficacy of grants and loans as financial devices should also be analyzed. The recent program, however, raises the presumption that with the return of prosperity Federal grants can be cut and that in the interest of debt repayment many such activities should be curtailed. The degree to which this can and should be done ought to be investigated.

The danger is that in post-depression times too large a volume of public works may be maintained. It is far easier to expand than to contract expenditures on public works. If, therefore, the volume of public works in normal times interferes with debt retirement it may decrease the credit reserves of governments, thus interfering with their ability to meet unforseen emergencies and recurrent crises. The debt accumulations of one depression must be cleared away before the recurrence of the next else debt accumulation will be tantamount to capital appropriation. If the debts cumulate with successive depressions perpetual obligations will be created. Heroic measures may be necessary to escape their ultimate consequences. Such predicaments must be avoided by governments in all levels of the political hierarchy. Curtailment of public works in normal times must, therefore, be envisaged.

The undesirability of maintaining a normal public-works program of such proportions as to compete with private industry for labor, capital, and materials has already been indicated.[71] Such a policy is both inconsistent with plans of economic stabilization and apt to interfere with the subsequent expansibility of an emergency program.[72]

The real task for normal periods is the preparation of future cyclical plans and the vigorous prosecution of policies of debt retirement, heavy progressive taxation, credit control, and the like. If the accumulation of reserves is to be attempted this is the time when that should be done.[73] But whatever the policy it should be economically sound and fiscally possible. Federal assistance, advice, and encouragement should be offered to get local governments to adhere to these plans. That, however, is part of the task of cyclical public-works planning. Cooperation in the development of the program, together with Federal assistance in the extension of sound policies of fiscal management would be steps in the proper direction. Instruction in sound fiscal principles and in financial management have seldom been given either to citizens generally or to those who are called upon to administer the governmental fisc. There has been all too little discussion among the financial officers of the governments of the Nation as to the kind and type of policies to be pursued. In such a setting, central control of financial operations is an impractical suggestion. Even the States themselves have made all too little headway in assuring the pursuit of proper and economically sound financial practices by the subordinate governments directly under their control. Yet if a public-works program is to be successful it involves the financing of the program in depression times by means of public borrowings and the rapid retirement of these debts with recovery and during prosperous periods. This implies that similar trends should be observed both in the volume and timing of debts and taxes—State and local as well as Federal.

In order to provide for the orderly contraction of public-works expenditures and the subsequent repayment of debts with recovery, some control and leadership by the National Government is essential. Inasmuch as direct control over the volume of debts is impossible, perhaps financial counsel could be supplemented by a policy of reducing grants in normal periods as public-works construction by minor units increases or by increasing grants as the payment of existing loans improves. Thus grants in normal times might be used to control both the volume of public-works construction and to stimulate the more rapid retirement of existing debts incurred for the construction of public improvements. Such indeed was the proposal of Professor Bowley, who suggested for England "a uniform budget of national debt repayment plus loans to local governments for public works, the one to decrease as the other increases."[74]

Moreover, in normal times such capital improvements as are necessary should be financed as a general rule from current revenues. This policy cannot be made inflexible and is hardly appropriate in the case of self-liquidating projects or government industries. But if public works in depressions are financed by loans to be repaid in prosperous times, such construction as does take place in normal periods should be financed on a pay-as-you-go basis.

[71] Cf. *ibid.*, p. 399.

[72] *Ibid.*, p. 398.

[73] The merits of such plans, involving the alternate investment and liquidation of funds, may be doubted (cf. ibid., p. 389ff.). The validity of any stabilization plans must be weighed in the light of the possible alternatives. Cyclical debt management seems to the writer to be preferable to any other reserve plans. Its essence is a reserve of credit.

[74] Clark, Economics of Planning Public Works, p. 165; cf. Bowley et al., Is Unemployment Inevitable? pp. 373–374; Minutes of Evidence, taken before the Committee on National Debt and Taxation, 1927 (London), pp. 265 ff.; Report of Committee on National Debt and Taxation, 1927 (Colwyn Committee), pp. 323–26.

D. CONCLUSION

The division of costs of public works should be viewed as a problem in the incidence of taxation to defray the cost of capital improvements rather than as a problem in the apportionment of costs among units of government. The fundamental question for determination is what citizens or groups of citizens should be called upon to defray the cost of particular improvements. The answer to this question is difficult because the principles upon which a division can be based are not clear. Nor do past precedents furnish a safe guide for the development of future policies. The divisions have been effected mainly by way of grants, though emergency loans have recently been employed. The formulas which have been utilized have been both simple and arbitrary and have not taken account of cyclical factors, the incidence of benefits, availability of local revenue, or of many other factors. While many factors need to be considered in developing policies in re divisions of cost the weight to be attached to each and the formulas themselves have to be developed. Even the interest of citizens and particular governments served by public works have to be evaluated.

The development of improved methods for dividing the costs of public works, therefore, seems to depend upon the prosecution of further research into the subject and an increase in the role of administrative authorities. Congress should define the scope of the public-works program, indicate the extent of the national interests, fix the limits on Federal assistance, and determine the amount of annual and reserve appropriations. The development of specific plans and the division of costs, within the limits set forth, should be determined by a Federal public-works agency working in close cooperation with representatives of subordinate governments. These plans should be developed as a cooperative enterprise rather than as a Federal bounty. If undertaken in cooperative fashion divisions of cost may be worked out in conference and voluntarily assumed. The results possible of achievement under such a plan seem to offer greater prospect of success than if burdens are imposed on subordinate governments (even through grants) by the national unit.

In order to provide for the proper timing of public works, and the adoption of appropriate financial policies therefor, as well as to coordinate these with the fiscal and monetary policies of the Nation, final decisions on these matters should be lodged with a fiscal advisory committee composed of the President, the Secretary of the Treasury, the Director of the Budget, the chairman of the National Resources Committee, and the chairman of the Board of Governors of the Federal Reserve System. Their task would be to approve the physical and financial features of the public-works program, to determine the volume of activities within the limits fixed by Congress, and to time the commencement and cessation of public-works activities. So important are these aspects of the program that divisions of cost are often determined by them.

Finally, the following additional observations should be made:

(1) If a public-works program is undertaken as a phase of a larger program of economic stabilization, it must be viewed as only one element in such a program. The program to be effective requires the adoption of a consistent, well-considered policy applicable to the whole field of economic activity. The revenue, expenditure, and borrowing policies of all levels of government should be correlated with the general stabilization program and function consistently as parts of that program.

(2) The public-works program should be a long-term plan, prepared to emphasize policies appropriate for depressions, the program for other times being subordinate thereto.

(3) For best results in the rehabilitation of the economic fiber of the Nation, the public-works program during depressions should be financed mainly by way of public borrowings.

(4) Such public works as are constructed during normal times should be financed, so far as possible, out of current revenues. Certain exceptions must, of course, be made but the emphasis should be placed, in ordinary times, upon the pay-as-you-go policy.

(5) As the policy of public works calls for the alternate expansion and contraction of construction projects, so does a wise financial policy call for the expansion of the debt in depression times and the rapid retirement of such obligations during prosperous periods. The productivity of the revenue systems should be geared to accomplish this.

(6) The whole problem of the division of costs of public works is so complicated by the chaotic condition of State and local finances and by the perpetuation of undesirable tendencies in the field of intergovernmental fiscal relationships that it is recommended that the National Government undertake without delay a comprehensive and long-term inquiry into Federal, State, and local finances, both to improve conditions in this field and to develop a better coordinated fiscal system.

(7) The Federal Government should bear its share of a cooperative program of public works during depressions and, in addition, should consider undertaking a comprehensive capital improvement program composed of projects of national interest. It should

also stimulate local expenditures. The financing of demonstration and experimental projects by the Federal Government is also recommended.

(8) In addition, the Federal Government should make provision for loans to State and local governments to assist them in financing public works during emergencies. The lending of personnel and equipment is also suggested.

(9) It is recommended that the annual public-works program for all levels of government include adequate appropriations to assure the continuous development of planning agencies, adequate provision for financing demonstration and experimental public-works projects, and for meeting the minimum requirements of a growing population.

(10) In order to plan wisely for the future, as well as to profit by mistakes of the past, a thorough inquiry into the capital improvement program of the recent depression is recommended. This should include the results of experiences of Civil Works Administration, Public Works Administration, Works Progress Administration, Reconstruction Finance Corporation, and Federal Emergency Relief Administration, as well as any other agencies involved. The results achieved by the system of grants and emergency loans for public works should also be analyzed.

PART III—SECTION 2
FEDERAL PUBLIC WORKS AND GRANTS IN AID

By Research Staff *

Public works construction, both directly and through grants in aid, has been an important function of the Federal Government since the first land grants were authorized in the ordinance setting up the Northwest Territory in 1787. Some public works functions have been directly assumed by the Federal Government from the beginning; others have been carried out by the States with the aid of Federal grants of land; and more recently, through cash grants matched by the States, a variety of public works activities have become the joint responsibility of the States and Federal Government. For the purposes of treatment, the discussion of Federal public works and grants in aid in the following pages has been divided in three parts. In part A the growth of a Federal interest in public works is historically traced; part B treats of Federal grants in aid to the States in two sections: (1) Land grants, and (2) the modern system of money grants. For purposes of comparison, a study of the British grant in aid system has been added as an appendix.

A. GROWTH OF FEDERAL INTEREST IN PUBLIC WORKS

Certain public works functions have been a concern of the Federal Government from its creation. In 1789 Congress authorized the taking over of lighthouses from the States, and shortly thereafter the construction of aids to navigation became a national function. As early as 1796 the first land grant for a road was given, and the construction of the Cumberland Road was authorized 6 years later. Gallatin's comprehensive plan for internal improvements in the first decade of the century was followed in 1817 by an act of Congress providing that the bonus resulting from the chartering of the Second Bank of the United States should be used for this purpose. Madison vetoed the bill on constitutional grounds, but opposition to internal improvements did not deter Monroe from signing the first rivers and harbors bill in 1823. Up to 1830, $5,600,000 [1] exclusive of land grants had been spent on internal improvements, but from this date to the Civil War subsidies were almost exclusively confined to land grants to the States for military wagon roads. In 1850 a land grant was given for the Illinois Central Railroad, but most of the big land grants for this purpose came after the Civil War.

The establishment of the Mississippi Valley Commission in 1879 marks the entry of the Federal Government into the field of flood control, although assistance previously had been given to sufferers from floods. Reclamation first appeared as a Federal concern in 1849 and 1850 with the grants of swamp land to the States for drainage. Grants of arid land for the purpose of irrigation were authorized in 1893, and the United States undertook the irrigation of public lands in 1902. The growth of national interest in each of the more important public works activities is a story by itself.

Roads and Canals

The question of road and canal construction by the Federal Government is intimately connected with that of the settlement of the western lands, and the reasons for Government entrance into this field cannot be discussed without reference to that problem. In two respects, at least, it was obviously to the advantage of the Federal Government to encourage expansion of population in the West. Only by settlement could the territory be defended against possible aggression, and retained as part of the United States; and settlement would bring into the Federal Treasury sorely needed revenue. The public lands were quite properly regarded as the most valuable of the natural resources and it was through their sale that it was hoped that the national economy might be placed on a sound footing and the public debt incurred in the Revolution be paid off.

The internal improvement policy was thus a necessary corollary of the land policy of the Federal Government. If it can be shown that the settlement of the western lands was a matter of national importance to the United States, then it can be shown that the construction of roads and canals, and later railroads, both within and through the States was a matter of national interest.

Beyond this there were three principal grounds on which Federal construction of roads and canals was justified. One of these was the need of social unification. "Those who understand the human heart best", said Calhoun in 1817, "know how powerfully distance tends to break the sympathies of our nature. Nothing * * * tends more to estrange man from man. Let us, then, bind the Republic together with a perfect system of roads and canals." [2] Secondly, roads and canals would be instrumental in increasing

* Principally Harry L. Case, Harold W. Metz, and Charles M. Wiltse.

[1] Channing, E., History of the United States, vol. V, p. 407, n. 1.

[2] John C. Calhoun, Works, II, p. 190, New York, 1853.

the national wealth. "If we look into the nature of wealth", observed the same speaker, "we will find that nothing can be more favorable to its growth than good roads and canals." [3] Third was the argument of national defense. These three points recur in practically all discussions of the subject.

In addition, there was a group of arguments tending to prove that only the Federal Government could provide for these necessary improvements. First, there was the question of the jurisdictional inability of the States to deal with problems that were necessarily interstate. Second, the new States were financially weak when admitted into the Union and the old States in many cases were seriously in debt. Third, there was shortage of private capital. Once the end was admitted to be desirable, these considerations were weighty arguments for Federal participation.

An analysis of the voting on various of these internal improvement bills shows broadly sectional divisions of opinion. The great majority of the western Congressmen can usually be relied upon to support the appropriations, and a majority of the New England and South Atlantic Congressmen to be opposed to them, the Middle Atlantic States usually falling on the internal improvement side.[4] Something of a case can no doubt be made out to show that national interest was in part at least only local interest "writ large." Yet it is not to be denied that by 1825 a definite theory of national interest had been developed in the discussion of internal improvements, and that a basis of distinction—following Monroe—had arisen between public works of a "national character", and works of a "local character."

In the last half of the nineteenth century the subject of roads and canals was lost sight of with the concentration of interest on railroads. The arguments for Federal aid, however, were substantially the same as those which had been used in support of grants for roads and canals. Of the proposed Illinois Central Railroad, for instance, it was said that the road "will form a great national thoroughfare connecting the North and the East with the South, with attendant commercial advantage to all." [5] Nor were the social benefits ignored in the congressional debates. "The railroads", said Representative Webster, "bring within a few days' travel the most distant parts of this widespread Republic—improve their social feelings—soften and subdue their prejudices—unite their commercial interest—and form the sinews and ligments which must forever and inseparably bind and cement them into one common and united people." [6]

[3] Ibid.

[4] Based on analysis of a number of divisions as recorded in the Congressional Globe. The uniformity of these divisions is obvious even to the casual reader.

[5] Senator Shields, in Congressional Debates, 31st Cong., 1st sess., p. 848.

[6] Congressional Debates, 24th Cong., 1st sess., p. 4544.

Another argument frequently advanced for Government support of railroad construction was that of improved and cheaper mail transportation, but the principal argument without question was that grants of land to railroads would make salable and enhance the value of the public lands. Public lands in many of the States had been on the market for 20 or 30 years without buyers. The reason for this, it was said, was not that the lands were without value, but that they were inaccessible. Their resources, even if exploited, could not be brought to market. But they would immediately become salable once a railroad was constructed through them, and by the simple act of giving away some land, the Federal Government would add value to the lands that it retained.

This was the real ground on which most of the railroad grants were argued, and it was possible to obtain support on this reasoning from Congressmen who were strongly against the idea of internal improvements by the Government. Thus Calhoun said that, "It does not belong to the category of internal improvements at all. It is not a power claimed by the Government as a government. It belongs to the Government as a landed proprietor." [7]

The concept of national interest took still another form in the discussions on construction of railroads to the Pacific coast. A transcontinental railroad, connecting the Atlantic with the Pacific Ocean, was the sort of monumental enterprise which appealed to the popular imagination, and engendered dreams of national greatness and international prestige. In 1850 California was the West in the same sense that the States beyond the Alleghenies had formerly been the West. The same aspirations for more extended trade, and a greater Nation, operated then as operated in 1815. The railroad had made possible thoughts about a continental empire which were preposterous before its advent.

To secure the new West to the Union was therefore a patriotic ambition. Not only California, but all of the intermediate territory of the West could be assured by establishing effective communications. "A railroad communication between the Atlantic and Pacific Oceans would secure that entire region to us forever." [8] The defenselessness of California from military standpoint was much stressed, and national defense was no doubt one of the most effective of the many arguments advanced. Also influential was the notion that a great trade would develop, by way of San Francisco, with the Far East, and that the railroads of the United States would carry not only American trade across the continent but European trade as well.

[7] Congressional Globe, 30th Cong., 1st sess., p. 537.

[8] Representative Brooks, in Congressional Globe, 33d Cong., 1st sess., p. 925.

The Pacific roads differed from other railroad constructions in one important respect: They were to be built almost entirely upon the public domain of the United States. Hence many constitutional questions were avoided, and against the strong sentiment for the roads, the opposition was never as strong as that against other internal improvements. It was clear that grants of some sort would have to be made to corporations, or that the United States would have to build the roads itself; but the old argument that it was a function of the States was obviously irrelevant.

In the twentieth century the highway question reappeared, taking two different forms. On the one hand was the interest in developing roads for the facilitation of interstate commerce. The United States Chamber of Commerce put itself on record before the Senate Committee as believing that "Federal appropriations should be made only for assistance to State and Territorial highways which will become a part of an interstate system"; [9] that aid for intrastate roads should be confined strictly to those which would become a part of a "national system."

The other interest was that of the farmers, who wanted to see rural post roads constructed with Federal aid. In order to show that this was not a matter of mere local or class interest, but distinctly national in its implications, the agricultural group was forced to expand somewhat further the meaning of "national interest." It was necessary to make use of an essentially organic conception of society, in which the welfare of the whole is inextricably bound up with the welfare of the parts. In discussions of the Federal Road Act of 1916, it was considered relevant to the question of national welfare to show at length how the farmers, as a class, would benefit from the development of rural roads.[10]

Aids to Navigation: River and Harbor Improvements

That branch of public works which falls under the general heading of aids to navigation (excluding canals, which were always discussed in conjunction with roads) has been considered within the proper realm of the Federal Government from its origin. Foreign commerce was then, and has continued to be, a matter of national interest. Its fostering has been a care of the Federal Government since 1789.

Appropriations for the construction of piers and lighthouses and the placing of buoys drew forth no comment in Congress at the time, which would seem to indicate that the power over and expediency of this form of public works was not seriously questioned. Andrew Jackson, a severe critic of Federal participation in "internal improvements", could well say in 1830 that "the practice of defraying, out of the Treasury of the United States, the expenses incurred by the establishment and support of lighthouses, beacons, buoys, and public piers within the bays, inlets, harbors, and ports of the United States to render the navigation thereof easy and safe, is coeval with the adoption of the Constitution, and has continued without interruption or dispute." [11]

Not until the middle of the nineteenth century, when extensive improvements on the Mississippi were proposed, was there any attempt at national justification for Federal activity in this field. The construction of such works as would promote sea navigation and foreign commerce appears to have been regarded as necessarily a function of the National Government as a sovereign state. The great internal waterway improvements were urged with this precedent well established. To the advocates of these improvements, the Mississippi River and the Great Lakes were in the same category as the Atlantic Ocean. They were great "'arms of the sea'—public highways and national highways * * * public for all of the inhabitants of the United States, in the same manner that the ocean is the public highway of nations * * *." [12] It was said that "the ocean, the lakes, and the great rivers are under the exclusive maritime jurisdiction of the United States. The commerce which floats upon them is national commerce; and every bar which forbids access to their harbors, or impedes their navigation, impairs the general prosperity, and retards our national progress." [13]

These arguments, which satisfied the Congress as to the propriety of Federal expenditures for improvement of the Mississippi and the Great Lakes, soon came to be applied to claims for improvement of lesser streams, not always, however, with equal cogency.

Flood Control

Closely related to the question of navigation is that of flood control. The arguments that have been advanced from time to time justifying the Federal Government in entering upon this work on the Mississippi River have been analyzed in much detail,[14] and they throw an interesting light on the philosophy of Federal public works. The most widely used argument centered about the consideration that the floods of the Mississippi bring disasters upon the people and States of the lower valley for which they are in no sense re-

[9] Hearings before the Senate Committee on Post Offices and Post Roads, 67th Cong., 1st sess., p. 66.

[10] Cf. 63d Cong., 3d sess., H. Doc. 1510.

[11] Message to Congress, December 1830, in Richardson, Messages and Papers of the Presidents, II, 508.

[12] Representative Dickinson, in Appendix to the Congressional Globe, 30th Cong., 1st Sess., p. 1120.

[13] Report of the House Committee, June 23, 1848, in H. G. Wheeler, History of Congress, II, p. 451.

[14] See Arthur D. Frank, The Development of the Federal Program of Flood Control on the Mississippi River, New York, 1930.

sponsible, and for which, therefore, they should not be required to pay. More precisely, the waters of the Mississippi are under the jurisdiction of the Federal Government, which is, therefore, bound by law as well as by justice to keep its river within bounds.[15]

It was also argued that every act of improvement, whether of municipal drainage, of reclamation, or of flood control upstream, speeds the drainage of the whole Mississippi system and aggravates the high-water problems of the lower river. Many of these improvements, it was said, are carried out by the Government itself or by the States, but in any case they are deliberate acts of men which tend to improve one section of the country at the expense of another. "The process by which the country above is relieved is that by which the country below is ruined."[16] The argument continued with the assertion that Federal improvements to navigation, in particular, in the form of cut-offs and blocking of natural reservoirs, have had a direct effect on floods, and the evils ought to be amended by the agents. Aside from the question of responsibility, the older argument of the inability of any one State to deal with the problem was advanced. A system of levees is as weak as its weakest link. Unified action is therefore essential, it was claimed, and this can only come from the Federal Government.

Congressional debates and official reports have advocated that flood control should be considered as a matter of national concern. In the first place, the simple fact that the problem is one which affects a large number of States, it has been urged, lends it a national character, an argument which is encountered again and again in the study of the whole field of Federal public works. Furthermore, the losses from Mississippi floods are not only serious losses to the delta States, they are great disasters to the Nation as a whole. There is the loss in property and lives, the loss to investors in southern bonds, the threat to the American supremacy in the world cotton and sugar markets, the demoralization of the people of the South, all of which in damaging the part damages the whole.

Again it has been argued that in certain respects the floods come close to the Federal Government in its more narrowly circumscribed functions. Floods become obstacles to interstate commerce, blocking all transportation facilities; they impair the movement of the mails; in wartime they would be serious impediments to the national defense.

This whole set of arguments reveals, however, only a part of the picture. For the older and better established navigation interests were strenuously behind the creation of the Mississippi River Commission (1879), the agency which was to be responsible for a flood-control program. Not only were the navigation interests dominant in the debate but many who expounded the cause of flood control made use of the navigation arguments. As those arguments have already been discussed, it is not necessary to go into them here.

This emphasis on the navigation aspect of flood control has been prominent in subsequent flood-control discussion until comparatively recent years. By 1916, however, a broader basis for Federal participation in flood-control activities was sought, and we find the chief of engineers in that year arguing that "Such control should preferably not be based on the uncertain and indefinite benefits that may accrue to navigation, but on the certain and positive benefits that will accrue in the protection of life and property from loss and in the prevention of the interruption of floods of general interstate commerce and the interference with the mails.[17]

More recently, however, flood control has come to be regarded not as a strictly national or as an exclusively local function, but as a matter for cooperative effort by the States and the Federal Government. The declaration of policy which prefaces the flood control bill of 1936 clearly states that "it is the sense of Congress that flood control on navigable waters or their tributaries is a proper activity of the Federal Government in cooperation with the States, their political subdivisions, and localities thereof", and provides that Federal expenditures for this purpose shall be conditioned upon provision by the States or their subdivisions of necessary land, easements and rights-of-way; and on agreement by State and local agencies to hold the United States free from damage claims, and to maintain and operate the works after completion.[18]

Reclamation

Although in some respects related to flood control, the Federal reclamation program was conceived from its inception as incidental to or a part of a land program. This is particularly true of irrigation. The irrigation of the arid lands was urged primarily on the ground that it would provide homes and sustenance for a farming population. "The principal object and purpose of this bill" (which became the reclamation law of 1902), said Senator Clark, "is to redeem the desert lands of the arid regions * * * so that they be made homes and permanent abiding places for the settler and his family."[19] The irrigation program, in other words, was a homestead movement—or at least was advocated as such. It is this which lends color

[15] Congressional Record, 45th Cong., 3d sess., pp. 979–80.

[16] Report of the Secretary of War, January 1852, House Committee on Flood Control, 70th Cong., 1st sess., H. Doc. No. 5.

[17] Report to the Secretary of War, H. Doc. No. 1792, 64th Cong., 2d sess., p. 3.

[18] Public, No. 738, 74th Cong., secs. 1 and 3.

[19] Congressional Record, 57th Cong., 1st sess., p. 2223.

to the whole set of arguments. The cultivable land of the United States had been in large measure appropriated and it was therefore necessary to bring new land into the market.

Why was this thought desirable? On the one side, there was the argument of the intrinsic worth of growth and improvement for their own sakes. "The very heart of a nation is always its people", it was urged, "and governmental policy should ever be concerned with the healthy growth of its population. To make room for the increase and influx of population, mammoth irrigation works must be constructed." [20] The notion that great stretches of land within the United States should remain unproductive, moreover, was found to be a reflection on the American people. "That this huge acreage", it was said, "should remain practically a desert is not in harmony with the progressive spirit of the age." [21]

On the other side, there were arguments to show that various social problems could be brought to a solution by these means: unemployment and poverty, in particular, and the attendant dangers to security. Much is made of the virtues of the agricultural class. In fact, the language of 1900 is practically the language of Jefferson in 1800.

In addition to this social argument, there is the familiar economic argument of the increase in national wealth which will attend the utilization of idle resources. Manufacturing and transportation, especially the transcontinental railroads, are benefited, with consequent gain to the people as a whole.

An important consideration in irrigation policy was that practically all of the lands in question were owned by the Federal Government. The issue here was not, however, as it had been earlier—so much the enhancement of public land values as the obligation of the Federal Government to develop and improve its estate for the benefit of its citizens. This transition from interest to obligation is not without significance in the history of Federal public works.

A second division of the field of reclamation is drainage. In urging Federal participation in this work, its early advocates were concerned primarily with contrasting the present burden to the nation with the potential wealth from the swamp lands. The possibility of national self-sufficiency in sugar and various tropical products was particularly stressed for Florida and Louisiana waste lands. As usual, the enhanced value of the adjacent public lands was mentioned, and the military advantages of doing away with inaccessible territory, especially where, as is the case of Florida, the inaccessible area cut off efficient communications with a key position.

Recent agitation for Federal aid in drainage has been pressed by the National Drainage Congress, which petitioned Congress in 1914 for financial aid in the name of "the protection, drainage, and reclamation of the overflowed and swamp lands in the United States, in the promotion of the general welfare, in the prevention of the dissemination of malaria and other diseases among the several States, and to promote interstate commerce by navigation." [22] Of the points made in the bill's title, the one most stressed was the menace to public health, which was taken to be a matter of national importance. Disease knows no State lines, it was pointed out. The argument of agricultural self-sufficiency was put forth, as was the familiar one of the opportunities for homemaking and the virtues of the agricultural way of life. The "undeveloped possibilities of transportation and marketing" were mentioned.[23] The final contention based on the interstate character of the problem, was that "an issue so big and broad and inclusive * * * must be a national matter." [24]

National Interest in Public Works

Sufficient material has perhaps been presented to give some understanding of the growth of Federal interest in public works. If one may judge by the discussions in Congress and elsewhere, the extension of Federal activity into the field has been based partly on considerations of the general welfare and partly on the special jurisdictional and financial competence of the Federal Government. Although the general welfare clause in the Constitution has not by any means always been relied on as the source of the power, the interpretation of the other powers has been colored by views of that welfare. The expression "national interest" seems to have no connotation different from that of "general welfare." The more common language is that of "objects of national importance" or "objects of a national character."

It is scarcely necessary to point out that there has not been unanimity of opinion on any given project that it was a matter of national and not local importance primarily. The claim of national interest has quite naturally been most strenuously advanced by those who would profit from the local benefit, and opposed by those who would not. If the concept of national interest is legitimate at all, however, it must rest on a theory of "general will" and if a project obtains the support of the majority it must be assumed

[20] Proceedings, Seventh National Irrigation Congress, p. 18.
[21] In House Committee Report No. 2927, 56th Cong., 2d sess., p. 6.
[22] H. R. 8189.
[23] S. Doc. No. 877, 72d Cong., 2d sess.
[24] Ibid.

to have been endorsed as "national" in import. To this one exception must be allowed. If each such project is not passed on as a single item, or part of a comprehensible whole, then the claim of national interest is never tested and the arguments are irrelevant. This appears to have been the case in many appropriations; but in general such "log-rolling" has been the exception rather than the rule in Federal public works.

B. FEDERAL GRANTS IN AID TO THE STATES

The development of a system of grants in aid in the United States falls into two distinct periods, with the grant taking correspondingly distinct forms.[25] From the first partition of the Northwest Territory in 1787 until the last State entered the Union in 1912, land was given to the States in varying quantities for specific purposes, with or without conditions as to use; and beginning with the Weeks Act in 1911, money grants, to be matched by the States and subject to definite limiting qualifications, have been used. In neither period, however, has there been any attempt to fit the grant system into a consistent philosophy of government. The existence of a State or National interest is postulated but not defined, and no criterion for evaluating the benefits assumed to arise for the different interested parties has been laid down.

A grant in aid may be defined as a subvention from a central government to a subsidiary unit, either for a specific service or to render assistance in the performance of governmental functions generally. The funds may be derived from the current income of the central government or from the issuance of bonds; and the grant may recur annually or be given only once. But though the central government may assume a secondary responsibility to be enforced through conditions attached to the expenditure of the funds granted, the prime responsibility for the performance of the functions concerned rests upon the subsidiary governmental unit.

Discussion of the governmental services for which the grant in aid should be used centers mainly around the problem of differentiating between those services which concern the central government and those of primarily local interest. In a society with a simple rural economy, and in which there is little intercommunication, it may be possible to draw such a line; but in an integrated society exhibiting a high degree of interdependence between communities, this cannot readily be done. Broadly speaking, the grant in aid may be advantageously used for any function conducive to the general welfare but which for various reasons it is desirable to have administered locally. It may, for example, be desirable to maintain local interest and initiative in the performance of the function; the conditions under which the function is to be performed may be so varied as to make central or bureaucratic control disadvantageous; there may be strong political opposition to direct assumption; or constitutional barriers may stand in the way of performance by the central government. Rarely in the past has any attempt been made to fit the grant in aid into a consistent philosophy of government, although the existence of a State or national interest has been implicitly recognized.

1. Land Grants

Through cession by the older States, through purchase, and by conquest, the Government of the United States acquired title between 1781 and 1853 to a public domain amounting, after the satisfaction of all claims against it, to nearly a billion and a half acres. Approximately one-sixth of this total, or close to 400,000 square miles, has been given to the States in the form of grants, for roads, canals, and railroads, for schools and colleges, for reclamation, and for public buildings.[26] These grants were, in effect, both a means of securing certain essential public services, and a subsidy to private enterprise; yet they served at the same time to increase the value of the land remaining in the hands of the Government.

Underlying these grants were various theoretical considerations primary among which was an assumption of responsibility on the part of the Federal Government for providing the initial means and subsidizing the development of education and communication. The reasoning was entirely realistic. Unless the new territory could be reached, it would not be settled; and unless educational facilities were provided, it would not attract as settlers the better types from the older States.[27] It was perfectly obvious that until it was settled, it was a liability rather than an asset. The policy so begun, however, quickly revealed other implications. Once grants of land were made to the new States, others assumed a vested interest in that part of the public domain lying within their boundaries; and when it became possible for the public-land States to wield the balance of power in Congress, the political motive was added to the economic one of encouraging settlement and stimulating development. Any grant to one State was a potential gift to all others in which there remained public land.

[25] On Federal grants in aid only 1 extensive study has been made, Federal Grants in Aid by Austin F. MacDonald.

[26] See table I, below.

[27] M. N. Orfield, Federal Land Grants to the States, pp. 39 ff.

Education

Approximately 115,000,000 acres of land have been given to the States for educational purposes, of which 98,500,000 acres went for the establishment and maintenance of common schools. The practice of giving away the public lands for educational purposes had its origin in the Northwest ordinance.[28] Every State admitted to the Union since 1802 has received school lands from the public domain with the exception of Texas, which retained all its own public lands, and Maine and West Virginia in which no public land existed. Prior to 1848 the grant was 1 section in each township;[29] from 1848 to 1894 2 sections in each township were given;[30] and the 3 States admitted since 1894 have each received 4 sections out of every 36.[31] Previous to 1836 the lands were given directly to the townships, or to the States for the benefit of the specific townships; but beginning with the admission of Michigan,[32] the lands were given to the State for the benefit of the entity.

Federal controls over the use of school-grant lands were virtually nonexistent for three-quarters of a century. Not until 1875, when the Enabling Act of Colorado[33] set a minimum figure of $2.50 per acre, were any stipulations as to sale of the lands included; and it was 1889 before there were any formal restrictions on leasing.[34] States receiving school-land grants since that time have been subjected to detailed regulations as to sale or lease, and have accepted the provision that schools receiving the benefit of the grant should remain under State control. Colorado's Enabling Act, and all subsequent common-school grants, required that land-grant moneys should be invested as a permanent fund, only the interest of which could be used. In 1889, the mode of investment was specified, and in 1910 the rules governing investments were extended to all land funds.[35]

All public land States have also received at least two townships for the foundation of a university; and all of the States, whether public land or not, have received extensive grants for the foundation of an agricultural and mechanical college under the Morrill Act of 1862 and its amendments.[36] Under this act, each State received 30,000 acres of land or its equivalent in land scrip for each Senator and Representative in Congress. The minimum, therefore, was 90,000 acres. The largest grant of 990,000 acres went to New York. These grants were conditional upon acceptance by State legislatures of the terms of the act. At least one college had to be founded within a given period, a minimum price was set on the sale of the land, and an annual report was required. Only 10 percent of the proceeds of the land grants might be used for experimental farms. Additional yearly sums voted by Congress for agricultural colleges under the second Morrill Act in 1890 were to be taken from the proceeds of the sale of public lands,[37] but gradually this restriction was dropped.

Internal Improvements

Land grants for internal improvements—the frontier equivalent of public works—have amounted to a total of 65,000,000 acres, going back to 1796 for the inception of the policy.[38] Grants for wagon roads total more than 3,000,000 acres; the States carved from the Northwest Territory got more than 4,500,000 acres for canals between 1828 and 1866; and 2,245,000 acres went to three States for river improvements which did not materialize. The public land States also received 11,500,000 acres for public improvements generally, 1,000,000 acres for public buildings, and 3,300,000 acres for public institutions. Twelve States were given 38,000,000 acres for railroads, which were turned over to private corporations, in addition to some 94,000,000 acres given to the railroads directly.

The early wagon-road grants were subject to forfeiture if not used for the specified purpose; but not until the Copper Harbor-Green Bay road grant in 1863 were the controls at all precise. In this case,[39] 30 sections of the allotted land might be sold at once, a second 30 sections on certificate from the Governor that 10 continuous miles of road had been completed, and so on. If the road were not completed in 5 years the unused land would revert to the United States. The time limit was later extended.[40] Congress also specified major details of construction such as width, grade, and drainage.

The controls over canals constructed with land-grant proceeds were similar to those laid down for roads. A survey to be passed on by the Interior Department was required and a time limit was set for completion, on penalty of forfeiture.[41] By 1827, the penalty included payment to the United States of the price received for all lands sold.[42] Performance before sale was not required. The canals, like the roads, were to be free from toll to agents or troops of the United States. The river improvement grants followed the model of the canal grants of the period, except that the rivers were to be toll free to all citizens; and more

[28] Revised Statutes, p. 13 (2d ed., 1878).
[29] 2 Stat. 226, 643; 3 Stat. 290, 349, 430, 491, 547; 5 Stat. 58, 60, 788, 790; 9 Stat. 58.
[30] 11 Stat. 167, 381; 12 Stat. 123; 13 Stat. 32, 89; 18 Stat. 476; 25 Stat. 680; 26 Stat. 216, 223; 28 Stat. 110.
[31] 31 Stat. 274; 36 Stat. 563, 571.
[32] 5 Stat. 60.
[33] 18 Stat. 476.
[34] 25 Stat. 680.
[35] 36 Stat. 563; 36 Stat. 571.
[36] 12 Stat. 503; 7 U. S. C. A. 301–28.
[37] 25 Stat. 417.
[38] Annals of Congress, 4th Cong., 1st sess., 1228, 1292, 1338.
[39] 13 Stat. 140.
[40] 15 Stat. 67; 16 Stat. 121; 17 Stat. 56.
[41] Orfield, op. cit., pp. 93–94.
[42] 7 Laws of the United States, 585.

significantly, the work was to be supervised by United States engineers. The later river improvement grants [43] called for sales of land in fixed amounts, a certain minimum of completed construction being required before each sale after the first.

Similar stages of growth were evidenced in respect to the railroad grants, the provisions coming ultimately to include the time limit for entering on, and for completing, the work, on penalty of forfeiture of unsold lands and of the price received for those already sold; and the progressive sale of lands as the construction advanced.[44] The later grants required completion of 20 miles of road before any land could be sold, patents then being issued for the lands opposite.[45] First the State or Territorial governor, and finally the Federal Government's own officers, inspected and certified the completion of each 20-mile unit. Certain broad regulations for construction were laid down, the mails were to be carried at whatever price Congress might fix, and the road was to be free for the transportation of United States property and troops. Forfeitures were enforced by the courts.[46]

Reclamation

By an act of 1848 all swamp and overflowed lands in Louisiana were granted to the State,[47] the proceeds from their sale to be applied to construction of drains, levees, and other reclamation work; and in 1850, a similar provision was made for all public land States.[48] In 1860, the benefits of the act were extended to Oregon and Minnesota.[49] A total of 15 States have received grants of swamp lands. In addition, certain other lands have been granted as indemnity to compensate for drainage and other works, already completed by the State at its own expense. Altogether the swamp land grants present one of the least defensible chapters in the history of the public domain.[50] Lands have been patented indiscriminately far in excess of actual swamp areas, to a total of some 64 million acres, or 100,000 square miles. More than three-fifths of the total area of Florida has been patented as swamp.[51] Congress had, in the case of the swamp land grants, the theoretical power to see to it that the proceeds from the sale of such lands are used as specified for drainage and reclamation. The question has never been raised, however, and the courts have rested the matter on the good faith of the States. Throughout the various land grants the controls imposed by law have not been enforced because of a lack of the necessary administrative supervision.[52]

A number of other Federal land grants ought at least to be mentioned in passing. Under the Carey Act of 1894,[53] any State containing arid land could get up to 1,000,000 acres of it for the purpose of irrigation; but because of the onerous conditions attached a total of only slightly more than a million acres has been taken up.[54] Ever since 1802 5 percent of the proceeds of the sale of public lands have been returned to the States in which the land is located.[55] This money is to be used for specified purposes, mainly education and public improvements. The States also share in the revenues arising from Federal forest and grazing lands [56] and the income resulting from the Water Power Act [57] and the Mineral Leasing Act.[58]

TABLE 1.—*Land grants to the States*[1] *up to June 30, 1934*

	Acres
Education:	
Common schools	98, 519, 946
Universities	2, 411, 018
Agricultural and mechanical colleges (Morrill Act)	11, 486, 000
Other educational institutions	3, 066, 800
	115, 483, 764
Internal improvements:	
Military wagon roads	3, 359, 188
Canals	4, 597, 804
River improvements	2, 245, 236
Public buildings	1, 035, 273
Public institutions	3, 322, 015
General improvements	11, 498, 243
Railroads (to States)	38, 206, 486
Reclamation	1, 174, 903
	65, 430, 148
Swamp land	64, 853, 887
Salt spring land	652, 725
	246, 420, 524

[1] Based on reports of the General Land Office.

2. Federal Money Grants

The existing system of cash grants to the States, as distinct from grants of land or of moneys derived from

[43] Orfield, op. cit., pp. 97 ff.
[44] 10 Stat. 28.
[45] 11 Stat. 196.
[46] *Farnsworth et al., Trustees, v. Minnesota & Pacific Railroad Co. et al.*, 92 U. S. 49; *United States v. Tennessee & Coosa Railroad*, 176 U. S. 242; 26 Stat. 496.
[47] 9 Stat. 352.
[48] 9 Stat. 519.
[49] 12 Stat. 3.
[50] Swamp land grants were usually not questioned unless the same land was sought for railroad or other purposes, and brought into litigation. The number of known cases of lands which proved to be neither overflowed nor swamp, yet were patented as swamp lands, is regretably large. See, e. g., Land Office Reports for 1854, p. 74; and for 1855, p. 201; and General Land Office, Division C, Letter Record, vol. 30, p. 240; vol. 118, p. 157; vol. 352, p. 409.
[51] Ms. Report of the General Land Office, 1934, on file in the office of the Chief Clerk.
[52] Benjamin H. Hibbard, A History of the Public Land Policies, p. 560; Orfield, op. cit., pp. 134 ff.
[53] 28 Stat. 373.
[54] Ms. Report of the General Land Office, 1934, on file in the office of the Chief Clerk.
[55] Annual Reports of the General Land Office; Revised Statutes, section 3689.
[56] 48 Stat. 1273.
[57] 41 Stat. 1072.
[58] 41 Stat. 450.

the sale of land, dates from the passage of the Weeks Act in 1911. Under this system the Federal Government contributes to the support of various functions of the States, securing in return for its contribution some measure of control over the administration of the function or service involved. These Federal money grants are separately treated below.

Highways

The largest and most significant of the Federal grants is that for highways. This had a modest beginning with an appropriation of $5,000,000 for the year 1917 for the construction of post roads in cooperation with the States,[59] but it has grown to an appropriation of $125,000,000 for 1936.[60] The original was closely tied up with the postal power, and it was not clear whether the construction of land-service roads or main interstate routes was contemplated. In fact the debates on the Public Roads Act of 1916 clearly indicate that the act represented a compromise between the view that only interstate routes should be improved and the view that land-service roads alone should be developed. Not until 1921 did the main emphasis shift to interstate highways.[61]

The money appropriated is distributed among the States one-third on the basis of population, one-third on the basis of area, and one-third on the basis of rural free delivery and star-route mileage; but no State is to receive less than one-half of 1 percent of the appropriation.[62] All Federal funds must be matched by State money. In States with a large area of public land, however, Federal funds may exceed 50 percent of the cost of a given road by one-half the percentage that the public lands exceed 5 percent of the State's area.[63] Federal-aid roads must be maintained at the expense of the States, which adds to their financial burdens. In the case of failure adequately to maintain a road Federal funds may be used, but these are then deducted from the State's share.[64] Seven percent of the road mileage in each State, consisting of main interstate routes, is to be designated as the Federal aid system. Sixty percent of the funds available must be expended on the most important three-sevenths, and the remaining 40 percent of the funds can be used on the rest of the system. When the Federal-aid system has been 90 percent completed it can be increased by another 1 percent.[65]

Emergency conditions have influenced the financing of the Federal highway system. In 1930, when the depression first set in, it became apparent that the States were not able to match Federal funds. Congress authorized the advance of $80,000,000 to the States for this purpose. These advances were to be deducted from Federal-aid payments beginning in 1933.[66] Two years later Congress authorized the R. F. C. to advance to the States $120,000,000 to match Federal funds, repayment to be effected by deductions from Federal-aid payments commencing in 1938.[67] The act of June 18, 1934, waived the requirement of repaying the funds advanced under these two acts.[68] During the fiscal years 1934 and 1935 no funds were available under the Federal Highway Act, but section 204 of N. I. R. A. granted $400,000,000 for highway work,[69] and the next year $200,000,000 was made available.[70] These sums, however, did not have to be matched by local funds. They were distributed among the States seven-eighths according to the formula in the 1921 act and one-eighth on the basis of population. By virtue of the act of April 8, 1935, $200,000,000 was distributed among the States on the same basis and under the same conditions as provided in the Highway Act of 1921.[71] The Bureau of Public Roads has also been given jurisdiction over the program of grade-crossing elimination provided for by the act of April 8, 1935. These funds are to be allocated among the States as follows: One-half on the basis of population, one-fourth according to mileage in the Federal-aid highway system, and one-fourth according to railroad mileage. So far the expenditure of $200,000,000 for this purpose has been authorized.

Floods on the Mississippi River led Congress in 1927 to grant $3,654,000 to Mississippi, Louisiana, Arkansas, and Missouri for the building of roads and bridges under the same conditions as those in the Federal Highway Act,[72] and the States of Vermont, New Hampshire, and Kentucky shared in a similar flood appropriation of $5,196,994 in 1928.[73] In both of these instances Federal funds had to be matched by local contributions.

The original Federal Road Act specifically provided that no part of the Federal funds could be expended within the limits of places that had a population of more than 2,500 as shown in the last preceding census except such parts of streets or roads in larger places where the houses were more than 200 feet apart measured inward from the outer boundaries thereof.[74] In 1928 it was provided that no Federal funds could be expended on building a bridge within or partly within

[59] 39 Stat. 355.
[60] 48 Stat. 995.
[61] 42 Stat. 212, sec. 11.
[62] 39 Stat. 355, sec. 4.
[63] 42 Stat. 212, sec. 11.
[64] Ibid., sec. 14.
[65] Ibid., sec. 6.
[66] 46 Stat. 1031.
[67] 47 Stat. 709.
[68] 48 Stat. 995, sec. 14.
[69] 48 Stat. 195, ch. 90, sec. 201.
[70] 48 Stat. 995, sec. 1.
[71] Session Laws, 1935, p. 115.
[72] 45 Stat. 570.
[73] 45 Stat. 1381.
[74] Laws of 1921, ch. 119, sec. 2; 42 Stat. 212.

a city of 30,000 or more, but such limitation did not apply to an interstate bridge connecting a place of more than 30,000 with another place of 10,000 or less situated in another State.[75] The first general relaxation of the prohibition against expenditures within cities came in the Emergency Relief and Construction Act of July 21, 1932.[76] This provided for the advance of $120,000,000 to the States to enable them to match Federal grants. For the duration of the act the provisions of the Federal Highway Act limiting the construction of highways and bridges in cities were suspended. The Bureau has never computed how much money was expended within cities under this act. Section 204 of the National Industrial Recovery Act also suspended temporarily the limitations on the construction of highways and bridges in cities. By Executive order it was provided that 25 percent of the funds given for highway construction under N. I. R. A. should be expended in cities; and $115,042,340 has been allocated for that purpose, which is actually 29 percent.[77]

The act of June 18, 1934, permanently repealed the limitations on expenditures within municipalities, both as to the P. W. A. highway grants and as to grants in aid under the Federal Highway Act.[78] Here again by Presidential order the expenditure of 25 percent in cities was authorized.[79] It is desired by the Bureau that the same percentage of the grants for 1936 and 1937 under the Federal Highway Act should be expended within cities; but since many States cannot expend their own highway funds within the confines of the municipalities it is not feasible to compel the States to build such roads. It is also the wish of the Bureau that States contribute to the cost of city streets that form a Federal-aid system, so it would not satisfy the Bureau to have the contribution of matching funds come from the municipality. By the rules approved by the President July 12, 1935, for the expenditure of the $200,000,000 authorized for highway work under the Emergency Relief Appropriation Act of 1935, the same percentage is to be expended in the cities. It is desired that 35 percent of the funds for grade-crossing elimination should be spent in metropolitan areas.[80]

The Federal Highway Act provides for its administration by the Bureau of Public Roads acting for the Secretary of Agriculture. Each State cooperating under the act must have a highway department that is deemed adequate by the Secretary and that has complete control over the expenditure of State funds for construction and maintenance.[81] The Secretary may refuse a certification of cooperation to any State that neglects to appropriate funds sufficient for construction and maintenance, though this power has been invoked only once. The designation of the Federal Aid Highway System is done by the State highway department subject to Federal approval. The review of highway planning has been widely exercised by the Bureau only within the last 10 years. In addition, plans, designs, and specifications for each project must be approved. About 80 percent are accepted, 10 percent are accepted with qualifications, and the rest returned for revision.[82] All construction must be done under the direct supervision of the State highway department, subject to the inspection and approval of the Bureau of Public Roads, and maintenance is also subject to inspection. The Secretary is empowered to prescribe rules governing the design, construction, and maintenance of roads. The Federal Highway Act sets up strong but general standards which have been administered rigorously.

Education

Education has been the subject of a number of Federal subventions. None of the grants for this purpose have been integrated into a complete system. As previously stated, in 1862 each State was given 30,000 acres for each Member of Congress for the establishment of a college for the teaching of agricultural and mechanical subjects. In 1890 and 1907, cash grants were added which ultimately reached an annual total of $50,000 per State.[83] Another $20,000 per State was added in 1935, and Congress authorized the distribution of $1,500,000 by 1939 among the States for this purpose on the basis of population.[84] These grants do not have to be matched by State funds. This act is administered by the Office of Education which exercises but slight control over the colleges.

Approximately $10,000,000 per year is being distributed among the States for vocational education. This grant had its origin in 1917 with an appropriation of approximately $1,600,000 to be administered by the Federal Board for Vocational Education,[85] the functions of which were transferred to the Office of Education in 1933.[86] Slightly more than $10,000,000 was available in 1935; $4,000,000 for agriculture; $4,000,000 for trade, industry, and commerce; $1,000,000 for home economics; and a similar sum for teacher training.[87] Grants for agriculture are allocated on the basis of rural and farm population; trade, indus-

[75] 45 Stat. 683, sec. 4.
[76] 47 Stat. 709, sec. 301 (a) 1.
[77] Report of the Chief of the Bureau of Public Roads, 1934, p. 9.
[78] 48 Stat. 993, sec. 13.
[79] Rules and Regulations promulgated July 13, 1934, sec. 3a. Actually $47,885,000 was allocated for such work.
[80] Rules and Regulations approved by the President July 12, 1935, as amended Sept. 12, 1935, sec. 3.
[81] Federal Highway Act, sec. 2.
[82] The United States Bureau of Public Roads and its Works, 1932 (mimeographed) p. 26.
[83] 26 Stat. 417; 34 Stat. 1281.
[84] Act of June 29, 1935; Public 182, sec. 22.
[85] 39 Stat. 929, ch. 114.
[86] Executive Order 6166
[87] 48 Stat. 389.

try and commerce, and home economics on the basis of urban population; and funds for teacher training according to total population.[88] Minimum grants are given to each State, and all funds must be matched. Aids for vocational rehabilitation have been administered by the same authority since 1920.[89] During the past 15 years only a million dollars a year has been available for allocation to the States, and the basis used is total population. For the fiscal year 1936 another $841,000 has been authorized, and commencing with the fiscal year 1938, $2,938,000 will be available.[90] The standards under this act and its administration are less rigid than those applied to vocational education.

Agricultural Research

Since 1887,[91] research in agriculture has been fostered by grants in aid to the States for the maintenance of experiment stations. Though only 20 States had experiment stations when the basic act was passed, all the States and Territories have entered this field of activity. The first grants were only $15,000 per State per year, but this has been increased so that in 1935 each State received $90,000. These sums do not have to be matched. Under the Jones-Bankhead Act of 1935, an additional $600,000 (to be increased to $3,000,000 by 1941) is to be allocated to the States according to rural population, and these additional funds must be matched.[92] Twenty percent of the initial grant was made available for the purchase of land and buildings, while 10 percent of subsequent grants can be used for this purpose, and 10 percent for rental of land. The objects of experimentation are most broadly stated in the law, wide latitude being left to the States.[93] In actual practice, however, extensive control is exercised through informal consultations and agreements.

Agricultural extension work will receive approximately $15,000,000 of Federal funds during the fiscal year 1936. The Federal Government first introduced this element into the grant in aid scheme in 1914[94] when a flat grant of $10,000 was offered to each State and a sum ultimately amounting to $4,100,000 was distributed among the States according to rural population. Under a later act each State is given an added grant of $20,000 and $500,000 is distributed on the basis of rural population. All of these sums, other than the block grants, had to be matched from State and local sources. The Jones-Bankhead Act of 1935[95] authorized an additional $8,000,000 (to be increased to $12,000,000 by yearly increments of $1,000,000) out of which each State is to get a block grant of $20,000 with the remainder being allocated on the basis of farm population. No part of this grant has to be matched. The Department of Agriculture does not exercise extensive control over the State programs other than to approve the State directors. Some States, as Massachusetts, pay all of the non-Federal share, and others leave the matching of funds entirely to the counties. In 1932, costs were distributed as follows: Federal Government 39.2 percent; States 28.9 percent; counties 27.4 percent; local contributions 4.5 percent.

Forest-Fire Prevention

A grant for forest-fire prevention commencing in 1911 was the first of the present matched grants, and was also the first grant over which extensive Federal supervision was exercised.[96] Federal funds available have increased from $77,500 to $1,775,000 yearly. The Federal funds are distributed among the States according to need as determined by the Secretary of Agriculture. In no case may the Federal contribution exceed 50 percent. State plans are subject to extensive Federal control. In 1934, 39 States were cooperating.[97] In addition, small sums are available for forestry extension and the distribution of forest-planting stock.

National Guard

For more than a century and a quarter the United States has been giving aid to the militia, or National Guard. Of recent years the Federal Government has borne the full cost of pay and equipment, the States merely furnishing armories and their maintenance.[98] Federal funds, distributed on the basis of enrollment, account for almost three-fourths of the total, or $24,728,290 for 1934. Very little freedom is left to the States in administering the National Guard beyond determining whether or not they will have units and where they will be located.

Employment Service

By the act of June 6, 1933[99] a system of grants in aid for employment agencies was inaugurated. For the first year $1,500,000 was made available, and after that $4,000,000. Twenty-five percent is reserved for administration, veteran, and agricultural placement, and the rest is distributed among the States on the basis of population. Funds must be matched. The act is administered by the United States Employment Service which has very wide control over the cooperating State agencies. This control involves extensive

[88] 39 Stat. 929, secs. 3, 4.
[89] 41 Stat. 735, ch. 219.
[90] Act of Aug. 14, 1935, Public 271, sec. 531.
[91] 24 Stat. 440, ch. 314, sec. 1.
[92] Act of June 29, 1935, Public 182, secs. 2, 5.
[93] 7 U. S. C. A. 375.
[94] 38 Stat. 372, ch. 79.
[95] Act of June 29, 1935, Public 182, sec. 21.
[96] 36 Stat. 961, ch. 186, sec. 2; 43 Stat. 653.
[97] In general, see S. Doc. 12, 73d Cong., 1st sess., pp. 1051–1329.
[98] 32 U. S. C. A., chs. 1, 2.
[99] 48 Stat. 113, ch. 49.

supervision over plans, personnel, and administration. So far 34 States are operating employment offices under the act, and 2 are in the process of becoming affiliated. In some States a significant share of the matching funds are contributed by cities, notably in Virginia, Pennsylvania, and Missouri.[1]

Social Security

With the passage of the Social Security Act of 1935,[2] the Federal Government entered upon a program of subventions in the field of social welfare.[3] The payment of one-half of the cost of a system of old-age benefits is authorized, the Federal contribution being limited to $49,750,000. The grants from the Federal Government shall not exceed $15 per month per person. Grants in aid for the care of dependent children are also provided, the amount to be one-third of the cost of the operation of the State system but not more than $6 per child per month. Maternal and child welfare is to receive $3,800,000 per year. Each State is to get a flat grant of $20,000. On the basis of the number of live births, $1,800,000 is to be distributed. In addition to these funds which must be matched, $980,000 is to be given on the basis of financial need. Matched grants for crippled children are included ($2,850,000) as well as unmatched grants for child welfare work ($1,500,000). On the basis of the number of blind persons in the States, $3,000,000 is to be allocated; in this case the grants must be matched. Public health comes in for $8,000,000 to be allocated on the basis of population, special health problems, and financial need. To assist the States in the administration of unemployment insurance schemes, the act also provides that ultimately $49,000,000 may be granted to the States on the basis of population, number of cases and cost per case, and such other factors as the Social Security Board finds to be relevant.

Emergency Grants

Emergency conditions have resulted in two types of grants, grants that probably are only of a temporary nature but which have attracted wide attention and which involve new aspects of the problem of the grant in aid; these are grants under the P. W. A. and under the F. E. R. A. Title II of N. I. R. A. authorized loans and/or grants to the States and the political subdivisions thereof for the construction of public works. Added funds were appropriated for this purpose in 1934 and in 1935. To July 31, 1935, $258,346,000 had been allocated as grants and $429,138,000 as loans to public bodies under the 30–70 grant and loan basis under N. I. R. A. Under the 45–55 basis of the act of 1935 grants to the extent of $324,770,000 and loans to the amount of $173,906,000 had been approved to October 31, 1935. No tabulation has been made of loans and grants made to cities alone.

The Federal Emergency Relief Act of 1933[4] authorized the Federal Government to make grants to the States to help to meet the costs of poor relief. These grants were made directly to the States and were then redistributed by them to their political subdivisions. The machinery for the administration of this act was primarily State machinery and not Federal. Only in a very few instances did the F. E. R. A. step into a State and establish its own machinery for relief administration.[5] In fact the determination of who was a proper recipient of relief was left entirely to the States. The total cost of relief from May 23, 1933, to December 31, 1934, was $2,271,169,474; of which the Federal Government paid $1,549,572,495 (68.2 percent), the States contributed $298,664,648 (13.2 percent), and the local subdivisions raised $422,932,831 (18.6 percent). The figures for the first 6 months of 1935 are as follows: Total cost of relief $1,112,056,805; Federal contribution $857,463,220 (77.1 percent), State funds $115,037,803 (10.3 percent), and local share $139,555,772 (12.6 percent). No tabulation of the distribution of relief costs in the cities alone has been made. It should also be noted the Emergency Relief and Construction Act of 1932[6] authorized the R. F. C. to loan money for relief purposes. Loans could be made to the States or directly to political subdivisions. Loans made directly to the States were to be recovered by deductions from grants for highway construction. By section 14 of the act of June 18, 1934, Public Law 393, this requirement was waived; the loans thus became grants.[7] There was thus distributed $280,385,519. The requirement for repayment was not waived in the case of the loans made directly to political subdivisions, which amounted to $19,614,481.[8] In addition to the grants previously mentioned the Federal Government gives subventions to the States for marine schools, soldiers' homes, and forest roads and trails.[9]

[1] Hearing before the House Committee on Appropriations on Department of Labor Bill for 1936, p. 13.

[2] Act of Aug. 14, 1935, Public 271.

[3] From 1921 to 1929 grants were distributed for maternal and infant health, and from 1919 to 1921 the States received financial assistance for the prevention of venereal diseases.

[4] 48 Stat. 55.

[5] S. Doc. 56, 74th Cong., 1st sess., p. XVII.

[6] 47 Stat. 709.

[7] 48 Stat. 993, 996.

[8] S. Doc. 56, 74th Cong., 1st sess., pp. 3–5.

[9] A number of Federal bureaus also carry on certain functions with the cooperation of State governments. Here the prime responsibility for the performance of the undertaking rests on the Federal agency concerned. The amount of the State's contribution is largely determined by a process of bargaining. The State contribution may take the form of paying part of the salaries concerned, it may consist of the contribution of a staff, or it may take the form of direct money payments. The undertaking is put in the form of a contract setting forth in detail the purposes of the undertaking, the method of performance, and the share of both parties in the cost. Such cooperative agreements are extensively used in the Department of Agriculture, especially in the Bureaus of Agricultural Economics, Home Economics, Biological Survey, and the Forest Service, Chemistry and Soils, Dairy Industry, Plant Industry, and Animal Industry.

TABLE 2.—*Net expenditures for Federal aid to the States, 1920–35* [1]

[In thousands of dollars]

Item	Appropriation titles	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
	I DIRECT PAYMENTS TO THE STATES																
	Independent offices																
3	Federal Power Commission Payment under Water Power Act (41 Stat. 1072, sec. 17)					1	2	4		16	8	13	159	71	76	75	65
4	Veterans' Administration: Homes for disabled soldiers (United States Code—title 24, sec. 134)	1,095	966	764	465	855	706	581	409	706	565	575	452	786	758	523	487
1	Interdepartmental Social Hygiene Board: Aid to States in protection of military and naval forces against venereal diseases (40 Stat. 886; 41 Stat. 178, 888)	365	393	185	12												
	Payment to States for prevention (42 Stat. 61)	1,000	221	178	34												
	Payment to universities (research)	99	76	[2] 10	24	[2] 1											
	Payment to universities (educational research)	295	153	66	24												
	Total	2,854	1,812	1,152	559	855	708	588	409	722	573	588	611	857	834	598	552
	Department of Agriculture																
5	Experiment stations (12 Stat. 503; 24 Stat. 440; 34 Stat. 63; 43 Stat. 970; 45 Stat. 571, 1256)	1,440	1,440	1,440	1,440	1,440	1,440	2,400	2,874	3,357	3,840	4,335	4,340	4,357	4,359	4,358	4,384
6	Extension work (12 Stat. 503; 26 Stat. 417; 38 Stat. 372; 45 Stat. 711, 575, 1256)	4,471	5,032	5,474	5,810	5,821	5,860	5,879	5,879	5,878	7,163	7,540	8,650	8,633	8,607	8,352	8,580
7	Payments from national forest fund (34 Stat. 270; 35 Stat. 260; 36 Stat. 963; 38 Stat. 411)	1,070	1,180	1,023	846	1,321	1,302	1,243	1,286	1,285	1,351	1,565	1,678	1,241	568	651	821
8	Payments to school funds, Arizona and New Mexico national forest fund (36 Stat. 557)	79	73	60	36	50	41	28	14	26	36	41	41	31	21	29	23
9	Forest fire cooperation (43 Stat. 653; 46 Stat. 411)							556	739	945	1,266	1,383	1,639	1,717	1,659	1,585	[3] 1,503
10	Cooperative distribution of forest planting stock							33	71	84	74	80	76	96	97	61	
	Construction of rural post roads (39 Stat. 356; 42 Stat. 212)	20,306	57,452	91,653	72,118	80,969	95,337	88,480	82,801	82,500	84,001	77,888	135,563	129,805	103,608	43,327	13,271
	Federal-aid highway system advances (42 Stat. 666; 45 Stat. 755)												20,296	58,912	62,132	181,529	[3] 268,245
	Total	27,366	65,177	99,650	80,280	89,601	103,983	98,619	93,664	94,075	97,731	92,832	172,313	204,792	181,051	239,892	296,871
	Department of the Interior																
11	Colleges for agricultural and mechanical arts (12 Stat. 503; 26 Stat. 417; 34 Stat. 1281)	2,580	2,500	2,550	2,550	2,550	2,550	2,550	2,550	2,550	2,550	2,550	2,550	2,550	2,550	2,550	2,550
12	Payments to States under Mineral Leasing Act (41 Stat. 450)			1,807	2,305	2,781	4,656	3,460	3,172	2,500	1,733	1,388	1,777	1,317	1,200	1,215	1,202
13	5, 3, and 2 percent funds to States (public lands) (Revised Statutes, sec. 3689)		138	36	26	30	17	17	13	14	19	18	26	12	9	5	
14	Payments to counties in Oregon and Washington against land grants (44 Stat. 915)								6,103	1,130	297	187	4				
15	Coos Bay wagon road grant fund (40 Stat. 1180, sec. 5)									48	34	44	67	6	18	2	1
16	Oregon and California land grant fund (39 Stat. 222, sec. 10)										35	792	525	716	168	244	244
17	Oil and gas royalties to Oklahoma (44 Stat. 740; 42 Stat. 1448)								303	39	67	42	34	30	10	8	12
1	Cooperative vocational education in agriculture (39 Stat. 929–36)	707	1,072	1,375	2,035	1,952	2,448	2,756	2,658	2,795	2,836	3,151	3,423	3,722	3,394	3,056	3,904
	Cooperative vocational education in trades (43 Stat. 18)	780	1,038	1,385	2,036	1,901	2,462	2,864	2,891	2,920	2,942	2,956	2,949	2,980	2,653	2,124	3,997
	Cooperative vocational education in teacher training	610	799	996	1,263	1,000	1,037	975	989	1,016	1,023	1,029	1,042	1,076	941	878	1,071
	Cooperative vocational education in home economics (15 Stat. 1151)											249	481	715	736	640	1,025
2	Cooperative vocational rehabilitation (41 Stat. 735–7; 43 Stat. 430–2)		470	256	503	559	556	519	566	613	681	736	816	998	993	862	1,030
	Total	4,607	6,017	8,325	10,718	10,773	13,606	13,171	19,245	13,625	12,237	13,142	13,697	14,191	13,381	11,884	15,036

[1] Adapted from Treasury reports. Grants from emergency appropriations not included except where noted.
[2] Overpayment, subtracted from total.
[3] Includes expenditures under National Industrial Recovery Act and other emergency appropriations.

TABLE 2.—*Net expenditures for Federal aid to the States, 1920–35*—Continued

Item	Appropriation titles	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935
	I. DIRECT PAYMENTS TO THE STATES—continued																
	Department of Labor																
18	Welfare of maternity and infancy (42 Stat. 225; 43 Stat. 17; 45 Stat. 108)			217	602	721	884	955	1,006	972	1,139	10					
	U. S. Employment Service (48 Stat. 113)															909	1,927
	Total			217	602	721	884	955	1,006	972	1,139	10				909	1,927
	Navy Department																
19	State marine schools (United States Code, title 34, sec. 1122)	177	75	81	73	75	75	75	75	75	75	50	125	100	189	102	182
	Treasury Department																
20	Expenses of Division of Venereal Diseases, Public Health Service (40 Stat. 886; 42 Stat. 381; 43 Stat. 76)				191	93	23										
21	Education of the blind (20 Stat. 467; 34 Stat. 460; 41 Stat. 272; 44 Stat. 1060)	30	60	50	50	50	50	50	50	75	75	75	75	75	75	75	75
	Total	30	60	50	241	143	73	50	50	75	75	75	75	75	75	75	75
	War Department																
22	National Guard (United States Code, title 32, secs. 21, 22)	2,663	7,988	20,814	24,714	24,243	29,230	29,480	39,377	32,361	33,015	31,988	34,715	34,778	33,170	24,552	28,770
	Total, class I	37,697	81,129	130,289	117,187	126,411	148,649	142,938	153,826	141,905	144,845	138,685	221,536	254,793	228,900	278,012	343,413
	II. APPROPRIATION FOR COOPERATIVE WORK WITH STATES																
	Department of Agriculture																
24	Cooperative construction of roads and trails, national forests (39 Stat. 358)	1,699	1,225	951	786	1,071	1,444	65	[2] 2	[2] 25							
25	Federal forest road construction (40 Stat. 1201)	2,550	3,821	1,670	425	228	17	38	75	1							
26	Forest road development (42 Stat. 218, sec. 23)			524	3,072	2,824	2,948	1,134	2								
	Forest highways (42 Stat. 660, par. 2)			286	2,811	4,678	5,199	1,209									
	Forest roads and trails (43 Stat. 889)							6,725	9,220	7,606	9,405	7,961	10,824	12,288	6,636	12,659	[3] 10,134
27	Cooperative fire protection of forested watersheds of navigable streams (United States Code, title 2616, sec. 563)	87	123	355	400	388	387	68									
28	Cooperative farm forestry (United States, Code, title 16, sec. 568)							35	44	55	53	59	65	67	61	45	
	Total	4,336	5,169	3,786	7,494	9,189	9,995	9,274	9,339	7,637	9,458	8,020	10,889	12,355	6,697	12,704	10,134
	Treasury Department																
29	Preventing spread of epidemic diseases (United States Code, title 42, sec. 95)	496	952	574	337	317	509	419	217	383	264	273	257	281	279	199	203
30	Interstate quarantine service (38 Stat. 25)	5	26	21	22	18	34	55	66	70	68	71	64	67	33	33	34
31	Studies in rural sanitation (39 Stat. 21)	65	41	61	47	42	68	84	67	81	318	345	565	1,929	109	22	27
	Total	566	1,019	656	406	377	611	558	350	534	650	689	886	2,277	421	254	264
	Total, class II	4,902	6,188	4,442	7,900	9,566	10,606	9,832	9,689	8,171	10,108	8,709	11,775	14,632	7,118	12,958	10,398
	Grand total	42,599	87,317	134,731	125,087	135,977	159,255	152,770	163,515	150,076	154,953	147,394	233,311	269,425	235,118	290,970	353,811

[2] Overpayment, subtracted from total.
[3] Includes expenditures under National Industrial Recovery Act and other emergency appropriations.

3. Functions of Grants in Aids

The Federal system of grants in aid, having been described in brief, we can now turn to its analysis. Quite obviously the prime purpose of the grant in aid is to promote some interest of the granting government, though what constitutes an interest of the grantor—in this case the National Government—is a question of policy and nothing more. The interest may be centered quite specifically in the performance of a given function. In such a case the grant might be directly proportional to the interest in and the supposed benefit resulting from the performance of the function. Federal grants to States for the National Guard are an illustration; these approximate 75 percent of the total cost. Then again, the grant may only be large enough to coordinate and direct local action in connection with a function of central interest, but the purpose might not be to reimburse the locality for the total resulting benefit. In connection with some functions

of national interest there might conceivably be the added purpose of insuring that all local subdivisions have an equal opportunity to perform the function. The interest may not be in a specific function such as roads or education, but it might take a less concrete form such as financial integration, the promotion of administrative standards, or control over personnel. These functions of the grant in aid will be discussed further in the following pages.

Redistribution of Income

For a number of different reasons it may be desirable for the Federal Government to increase its income and redistribute some of this to the States. The reasons for adopting such a policy need not be considered here. There are a number of ways in which the income of the Federal Government may be redistributed among subsidiary governmental units, all of which are in use in the United States. One of these is the assumption of new functions by the central authority. The Federal Government has quite largely taken over the promotion of water transportation and of agriculture; while the States have been gradually taking upon themselves functions previously exercised by local government, such as the care of the insane. In very recent years a few States have assumed control of the county highway system.

A second method is the centrally administered locally shared tax, which is a tax administered by the central government but shared on some specific basis with local units. There are several hundred such laws at present in force in the States, and some precedent exists for the sharing of federally administered revenues with the States. For over a hundred years the Federal Government has shared with the States the proceeds of the sale of public lands, and more recently the income from water-power rights, oil rights, and grazing rights derived within the States has been similarly shared. Centrally administered locally shared taxes can be used advantageously by the Federal Government where it has a concern only for the distribution of funds and not in the services to be financed thereby.

A third method for the distribution of funds is the grant in aid. This device is to be preferred to the centrally administered locally shared tax because it supplies a means of controlling local standards of service and administration. Where local initiative and special regard to local conditions are considered to be desirable, the grant in aid has advantages not to be found in the direct assumption of functions. The early land grants to the States for education and internal improvements are an illustration of this type of grant, as also are the Federal grants for the administration of State unemployment insurance schemes. In another manner the grant can be used for tax integration as by refusing or reducing a grant if the proceeds of a given tax are not used for a specific purpose, as was done in section 12, act of June 18, 1934,[10] which provides that any State that diverts the proceeds of gasoline taxes from highway purposes should be subject to a pro rata reduction in Federal highway grants in aid.

Relief of an Element in the Tax Base

Another purpose that a grant in aid may serve is to relieve a given element in the tax base of part or all of its tax burden. This element is generally real property. From the very beginning one of the basic considerations behind the British grants in aid has been the relief of agricultural property from rates. The Local Government Act of 1929 entirely derated agricultural property and rated industrial and freight transport property at only one-quarter their annual value, while at the same time the grants in aid were greatly increased. The increased aid for schools and roads in New York from 1926 to 1930 was both for relieving the burden of taxation on real property and for the equalization of opportunity.[11] When a grant is given primarily for tax reduction, some central control over local tax rates must go hand in hand with it to insure that it is utilized for this purpose. So far the Federal Government has not used the subvention in this manner.

Equalization

The grant-in-aid may also be used for the purpose of equalization; that is, for insuring that all units administering a given function will have at least a minimum financial equality in its performance. In general, however, the interest of a government must be strong if it undertakes the equalization of function. This involves taxing the wealthier units for the benefit of the less wealthy, and presents various problems, such as the determination of the level at which equalization is to take place, and the method of effecting it. There are several different levels at which a given service may be equalized. The standard may be the average now existing for all units; it may be the best existing service now being rendered; or a level of performance may be selected which has not yet been attained at any point in the jurisdiction. Equalization may also take place at a level that is believed to be the defensible minimum. In a large heterogeneous country the achievements of equalization objectives may be difficult owing to lack of uniformity in the desirable level for equalization. The cost of constructing a mile of primary road, for example, will not be the same in

[10] Laws of 1934, ch. 586, sec. 12; 18 Stat. 995.

[11] About 37 percent of this increased aid for schools was used for tax reduction; and 53 percent for increased offerings, the remainder going for capital expenditure. Report of the New York State Commission for the Revision of the Tax Laws (1932), memorandum 2.

Maine, New Jersey, Arkansas, and Nevada. As regards equalization at a very high level, only a very wealthy central government can afford to do this except, of course, in the case of a relatively inexpensive service. It should be pointed out that when the average service being rendered is taken as the base, the average will continually move upward as the level of performance in the poorer districts is improved.

It is safe to say that previous to the Emergency Relief Act of 1933 equalization was not a consciously asserted function of Federal aid. Nevertheless, equalization was effected indirectly, as in the case of functions performed for the benefit of rural areas with funds raised by taxes levied on the country at large. This was true under the first Federal post roads act where the funds were used for land service roads, and the operation of the agricultural extension and experiment station acts also have this result. The attempt at equalization is more apparent in the administration of the grants for forest-fire prevention, while the Emergency Relief Act of 1933 clearly stated that financial need should be a criterion. Equalization is one of the functions of three of the grants contained in the Social Security Act. The provisions relative to maternal and child-health services and to State and local public-health services expressly state that financial need is to be taken into account, and the sections providing for the administration of State unemployment insurance schemes strongly imply it. None of these acts, however, attempt to define the level of service at which equalization is to take place. Section 602 of the Social Security Act provides that in the case of grants for public-health work the special health problems of the State should be considered. Relative to grants for administering the State unemployment insurance schemes there should be taken into account population, number of cases, "and such other factors as the Board finds relevant."[12] In the administration of the grants for forest-fire protection[13] and unemployment relief an attempt has been made to determine the level of service at which equalization is desired and in both instances the level is considerably above the average previously existing. Financial ability is not defined in any of these acts though the F. E. R. A. has made an attempt to estimate the ability of the States to support unemployment relief.[14]

There are several different methods by which equalization might be brought about. The main responsibility of financing the activity can be left to the local unit, the central government only furnishing assistance where there is a lack of such financial ability. All recipients must be required to make a uniform minimum financial effort, and the grantor then furnishes what funds will still be required to achieve the minimum service covered by the scheme. This financial effort may be defined in terms of the yield of certain taxes. The level of minimum effort will be determined by the financial position of the central government, the financial position of the units of local government, and by the cost of the service. The other significant method of equalization is for the central government to assume the basic responsibility for financing the minimum program, the localities being free to finance a more costly one at their own expense. This method can be used only where the central government has extensive sources of income or where the service concerned is not costly. It comes rather close to assuming the whole responsibility for the given service; and before it is used, careful thought should be given to the desirability of such assumption.

None of the Federal acts providing for equalization declare exactly what method is to be utilized. The Federal Emergency Relief Administration has had the most experience with the problem of grants for equalization. In distributing relief grants account has been taken both of the cost of rendering the service and of the ability to pay for it. In determining the cost of rendering the service the following are considered: The relief load, geographical variations in living standards and relief costs (climatic factors must necessarily be considered here), and the relative amounts spent by political units for welfare purposes other than direct relief. The determination of financial ability has been very difficult and could not be reduced to a formula. A number of different approaches were used simultaneously to determine economic ability of the States. One was the use of 10 indexes which included gainful workers, national income, retail sales, wholesale sales, motor-car registration, etc. The second method was a case study of the economic condition of each State based partly on data furnished by field agents. The third was the yield that would result from the application of a uniform tax system to all of the States supplemented by a consideration of constitutional limitations and debt burden.[15]

As previously intimated, the Social Security Act authorizes the Public Health Service to distribute $8,000,000 among the States on the basis of special health problems, population, and financial need. Fifty-seven and one-half percent will be allocated on the basis of population, 22½ percent on the basis of special health problems, and 20 percent on the basis of financial need. Financial need is based upon the per capita distribution of national income as determined by Leven, Moulton, and Warburton in America's Capacity to Consume.[16] No grants on the basis

[12] Sec. 302 (a).
[13] See S. Doc. 12, 73d Cong., 1st sess., pp. 1203–1229.
[14] See S. Doc. 56, 74th Cong., 1st sess., pp. IX–XIX.
[15] Ibid.
[16] P. 173.

of financial need are to be given to the 12 States with the highest per capita income. The States will have to match $5,400,000 of the grants, but will not have to match $2,600,000.[37]

Coordination

The coordination, integration, and direction of a service supplied by the local government but in which the central government has some interest is a function of the grant in aid. The grant may be given with conditions attached relative to the execution of the service, such as the Federal grants for highways, which are to coordinate State activity in the construction of a national system of roads. In the case of subventions for vocational education it would seem likely from the act and its administration that the purpose is to standardize such instruction and to secure performance at a given level. Grants for such purposes do not imply any form of vitiating central control. No unit of government need take a grant when offered; direction and guidance is not imposed from above; it is accepted voluntarily. Grants given for the purpose of coordination and direction need only be so large as is necessary to purchase the desired control over local administration. It is a question of giving a quid pro quo for the loss of administrative freedom. In the field of public works the Federal Government can use such grants to promote local developments in conformity with national plans; to insure that works are planned, designed, constructed, and maintained in agreement with acceptable standards of workmanship; and to secure adequate protection of Federal funds involved. The conditions attached should be closely related to the performance of the specific service. Direction and guidance are also related to grants given on the basis of equalization or of benefits; in the first instance to make certain that the benefits desired are actually being secured in an economical fashion, and in the second, to insure that equalization of opportunity actually results. The administration of systems of grants in aid will be considered in more detail later. The grant in aid is not the only device used by the United States for securing coordination. The collection of statistics (e. g., by the Office of Education), informal conferences of administrators, mere persuasion (passage of uniform vital statistics reporting acts), and tax refunds are among other methods that have been used.

Incitement of Local Action

Incitement of local action, the reward of effort in a given desired direction, is another possible function of grants in aid. This is useful in the case of functions that are not basically necessary, but which are useful and are still in the experimental stage. There is, however, a certain incompatibility between grants for the purpose of equalization and those for reward of effort. Only the financially strong units can afford to indulge in new experimental services, and the money raised to stimulate such activity comes from the poor as well as the financially able districts. It provides a system of aids for those units that are best able to furnish the service without assistance. Of course, those units might not use their ability in the direction desired without this added stimulus. Federal grants for maternal and infant hygiene, aid to dependent children and to crippled children, and for vocational rehabilitation have had for their purpose the incitement of local action. When the purpose of a grant in aid is incitement to action, comparatively wide latitude must be left to the grantee in developing the plans for the performance of the function. The Federal subvention given to stimulate local action has not been markedly successful; local funds per dollar of grant have not increased measurably in 15 years.

4. Forms of Grants and Methods of Distribution

A number of different forms of grants have been used by the Federal Government. One type is the block grant, or fixed sum given to each unit of government for the performance of a specific function. This method has been used in the case of the grants for agricultural colleges, for experiment stations, and for agricultural extension and vocational education in the form of minimum unmatched grants. Another method, only slightly better, is the unit grant, or flat sum for each unit of service rendered. This is used for the National Guard and for grants to State homes for veterans. Of itself it involves no accurate determination of need other than the amount of the service that the locality wishes to provide. More extensive favor has been accorded to the use of the percentage grant whereby the central government agrees to assume a given proportion of the cost of the service rendered by the subsidiary unit (utilized, for example, for agricultural extension, vocational education, vocational rehabilitation, old-age security, crippled children, dependent children, and the blind). Fifty percent is the share generally assumed; but in the case of forest-fire protection only 25 percent is paid, and for dependent children 33 percent.

Some method must be used for prorating among the local units the funds at the disposal of the central government in order to prevent the more able units from utilizing all of the funds at the disposal of the grantor. A maximum limit on the size of the grant may be set, as in the grants for old-age assistance and dependent children, or some type of formula taking

[37] Regulations governing allotments and payments to the States from funds appropriated under the provisions of sec. 601 of the Social Security Act, p. 10

need into account may be used. Population is often taken as a rough indication of need. Funds for vocational rehabilitation are distributed on the basis of total population, while urban population is the basis for some grants for vocational education, and rural population for others. Farm population has been resorted to for some of the new grants for cooperative extension work. Federal highway funds are distributed according to a formula that gives equal weight to population, area, and rural free delivery, and star-route mileage. Aid for maternal and infant health is allocated on the basis of the distribution of live births.

The grant in aid may be distributed according to a formula that takes account of both need and ability to pay for a service. The formula used under the British Local Government Act of 1929 is an example of an attempt to distribute funds in accordance with general need and ability. Population is weighted according to ratable value, density, unemployment, and the number of young children. The formula is so involved, however, that it is difficult to understand its derivation.[18] Federal grants for unemployment relief and for certain functions under the Social Security Act are supposedly to be allocated on the basis of need and financial ability; but the statutes do not present any formulas, this aspect being left to administrative determination.

The methods used for allocating grants for some purposes have grown complex because the statutory authorization has merely been amended rather than revised. Agricultural extension grants are quite complicated. Each State gets $50,000 that does not have to be matched; $4,600,000 is distributed among the States on the basis of rural population and must be matched; and $7,020,000 is allocated on the basis of farm population and does not have to be matched. Experiment stations have been getting $90,000 per year per State (unmatched) but under the Jones-Bankhead Act $600,000 (to be raised to $3,000,000) is to be distributed among the States on the basis of rural population and must be offset by State funds. The grants for agricultural colleges and for vocational education in agriculture have also become complicated by this process of accretion.

Administration of Grants in Aid

State Participation

The States must accept Federal grants before they become operative. The acceptance is generally by legislative action; but a number of grants provide for provisional acceptance by the Governor with subsequent legislative approval. The requirement of legislative acceptance seems to be sound, because the legislature ought to pass upon any policy under which it will be obliged to provide funds. Such acceptance is purely voluntary, and it is consequently difficult to see how a State can object to the Federal direction that generally accompanies it. In the case of a number of grants, such as those for highways, vocational education, vocational rehabilitation, employment exchanges, and forest-fire prevention, the States must have an adequate State organization to carry on the function.

The preparation and submission of plans of operation is a customary requirement. The presentation of an approved highway plan is a prerequisite to Federal aid; annual plans are required for assistance in forest-fire prevention; and plans for a period of 2 or more years are worked out in advance for vocational education. Extensive plans must be submitted annually for grants for employment exchanges. While the law does not require it, the practice of submitting plans in connection with experiment-station grants has arisen as the result of administrative action, thus avoiding duplication of effort. Budgets are submitted with plans in connection with several grants. In some instances, notably marine schools, veterans' homes, and land-grant colleges, the Federal Government has no control over the scheme of development to be carried out.

Federal Control

There may be several different degrees of administrative control of grants. There may be rigid statutory standards and rigorous administrative application, as is the case with the National Guard, where such a degree of central control exists that it might almost be considered a national activity highly decentralized. Vocational education is also in this general class. There may be general statutory standards with rigid administration as illustrated by the highway grants and the employment grants. There may also be rigid statutory standards and general administration as well as general statutory standards and general administrative control. Vocational rehabilitation and experiment stations are illustrative of this latter type. Very little control is exercised over land-grant colleges and none over marine schools and homes for veterans.

Various amounts of authority over the State administrative organization are provided. The State highway departments must be adequately organized and have complete control over construction and maintenance funds. The United States Employment Service can prescribe rules for the efficient operation of the employment exchanges. The Social Security Board will have some control over the State administrative organization for old age security and unemployment insurance. Personnel is subject to Federal control in several instances. The director of agricultural exten-

[18] See Appendix on British Grants in Aid.

sion of each State must be approved by the Department of Agriculture; and the memorandum of understanding generally prescribes the qualifications for extension agents which must be observed by the State director. The cooperative agreements for vocational education also prescribe qualifications for instructors although no statutory authority for this exists. The statute setting up the system of employment exchanges gives to the United States Employment Service the power to prescribe minimum standards of efficiency, and under this authorization most extensive control over personnel is exercised virtually putting the employment service of all cooperating States under civil service by such devices as cooperating with State civil service departments and administering examinations directly. The National Guard Bureau exercises wide control over National Guard personnel; but the Social Security Board is expressly barred from entering into this field.

The controls utilized by Federal agencies administering grants are of several types. The plans and budgets submitted in advance are a step in the process of control. Reports (statistical, financial, and descriptive) are required in most instances; but their completeness varies. The entire control exercised by the Office of Education over land-grant colleges is carried out by only one man; consequently extensive control over these colleges by a system of reports cannot be exercised. Field inspection is utilized in most instances. In a number of cases auditing and the inspectoral function are combined in the same agent (vocational education, vocational rehabilitation, and forest fire prevention). Relative to experiment stations, extensive financial control is exercised even to the length of a complete audit of all vouchers; but comparatively slight functional supervision exists. The Federal Bureau of Public Roads has the most complete system of supervision. Two and one-half percent of each appropriation may be used for this purpose. Plans for the Federal highway system in each State; designs, specifications, bids, and construction of each road are subject to review and inspection; while the entire Federal aid system is inspected twice a year to insure maintenance standards; and all vouchers must be approved by the district engineers before the State can be reimbursed for them.

The main sanction used to compel a cooperating State to adhere to the law and the memorandum of understanding is to refuse to grant further funds. Most administering agencies hesitate to do this because all control would then be lost. The statutes generally provide for an appeal to the head of the department and ultimately to Congress in such a case. In 1893, further grants to South Carolina for the land-grant college were refused, but Congress reversed this decision. Funds for experiment stations have been held up in several instances,[19] and in 1935 the Bureau of Public Roads ceased to cooperate with Georgia.

Conclusions

The functions for which the grant is to be used should be clearly formulated in advance because these determine the form of the grant, the formula, and the administration of the grant. In some instances different functions may be combined, such as payment in accord with national interest and coordination, or equalization and coordination; while others, like equalization and reward of effort, are incompatible. If financial need is to be considered the general method for its determination should be outlined. All grants should be considered in relation to the general fiscal system. The statutory authorization should clearly state the purpose of the grant, its function, and the method of distribution. The administering agency should not be left free to determine the objectives of the grant.

There would seem to be no place for grants without conditions. The history of the land grants is sufficient proof of this. But though the conditions ought to be demarcated in broad outline by Congress, there must be administrative latitude in their application. Completely objective standards to be applied by the States alone are not feasible. Federal administrative organization for supervision should exist with adequate control over plans, budgets, reports, inspections, and audits. Central control over the administrative organization, efficiency, and personnel of the State agency administering the function (as in the case of employment exchanges) is usually required, especially where coordination is being sought. Where the stimulation of action is the aim wider latitude should be given to the States than where the purpose is coordination. Upon the failure of a State to fulfill the conditions imposed, the Federal agency should have the authority to withhold the grant.

[19] In 1918 grants to Georgia for the maintenance of the agricultural experiment station were discontinued by the States relations service; but this determination was reversed by an act of Congress; 40 Stat. 973, 1000.

PART III—SECTION 3
BASES AND METHODS OF COST ALLOCATION

By Research Staff *

Those very public works activities which have in the past been carried forward by the Federal Government because of a genuine or an assumed national interest have contributed to render increasingly tenuous the distinction between Federal and non-Federal in this field. Transportation in all its forms, the development of agriculture through reclamation and irrigation, and the later combination of land and water uses in large-scale development projects have all combined to nullify for economic and cultural purposes the older political subdivisions and hence also the historical distinction between Federal, State, and local interest.

Basically public works are capital improvements designed to serve the needs of the people of the United States. Any particular project may supply benefits to a smaller or larger group of individuals, but almost certainly it will be a group which does not correspond to that served by any particular unit of government; and there is an increasing trend toward projects which cut across State lines, and affect more or less directly citizens of several States. The interest in a given project may often be less than national, but it will seldom be local in the sense that its benefits are confined to a local political subdivision, or even to a single State. The construction of a dam in Arizona supplies drinking water to the people of Los Angeles and the irrigation of lands in Wyoming may supply cheaper agricultural produce to Chicago.

For purposes of dividing costs and responsibilities, therefore, we must consider the problem not as one of weighing the interests of political units but as one of determining beneficiaries and devising means of assessing to the beneficiaries whatever proportion of the cost of constructing the project may be dictated by public policy. This does not mean that there will be no financial participation by the Federal Government. In many cases a more or less direct benefit may be identified as accruing to the people of the entire United States, such as that arising from national defense or from experimentation with new methods and processes; or it may be in the general interest to encourage certain agricultural developments, to foster industrial decentralization, or to raise the social and economic standards of a backward region. There is certainly a national interest in seeing that the need for capital improvements on the part of the people generally is supplied, even though no one public work affects them all, and this alone justifies the Federal Government in assuming a degree of responsibility for planning and initiating works projects even though it may not always justify the assumption of part or all of the cost.

There can be no exact determination as to whose responsibility it is to provide public capital, other than to say that it should be done by the government best able to do it. Governmental ability in this respect must ultimately be determined in terms of tax bases available, credit structure, resources and other financial obligations. So conceived, the problem of cost allocation becomes a question not of dividing costs between governmental units, but of determining who is to pay the charges for the use of the capital involved. The interest of the people generally may be sufficient to justify the Federal Government in supplying interest-free funds, leaving only amortization costs to the beneficiaries in a more circumscribed area; some portion of the amortization charges may also be assumed by the Federal Treasury; or the direct beneficiaries may be asked to pay both interest and capital charges. Because of its greater credit resources there is always a case for the supplying of the original capital by the Federal Government with the consequent saving in lower interest rates.

The assumption that the area of support should correspond to the area of benefit is, of course, justifiable only in terms of public policy. It may be for some reason desirable to exact payment from only part of the beneficiaries, or from others who derive no benefit. When either of these is done, however, it must be for definite reasons, clearly formulated after a careful weighing of personal and governmental interests.

Though the beneficiaries of public works projects cannot be identified with the citizens of specific political subdivisions the political unit must, nevertheless, be utilized in setting up machinery for recouping the cost of such enterprises. Lacking the power to create special taxing districts or to impose taxes other than excises on any except a population basis, the Federal Government must rely upon the States to devise means of assessing the beneficiaries of public improvements except insofar as recoupment can be secured through the sale of such products as hydroelectric power or irrigation water, or through excises such as the gasoline tax.

The problem of dividing costs and responsibilities for public works thus presents three aspects, which will be discussed in turn. The first is the problem of analyzing methods by which capital may be made avail-

* Principally James W. Martin, Harold W. Metz, and Charles M. Wiltse.

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able for public improvements; the second is the question of determining techniques for financing capital charges; and the third is concerned with means of securing effective control over expenditure to avoid needless waste and extravagance. Only insofar as these questions must be answered in terms of governmental units is the cost-allocation problem one of dividing financial and administrative responsibility between political subdivisions.

Methods of Making Capital Available for Public Uses

Public capital can be secured only from those who have it, by taxation or through loans. There are, however, numerous variations of these basic mediums which may be used for financing public improvements. Because of our decentralized political system there are innumerable taxing units which may or may not correspond to the areas of benefit from given public services, and there are numerous restrictions on the taxing power and on the use of credit. There is no single method by which capital may be made available for public uses which would be applicable in all cases or under all circumstances. The method used will vary with the particular enterprise to be financed, with the economic and political conditions at the time of undertaking the function, with the phase of the business cycle. Legal restrictions, customs, or popular prejudices may impede the use of an otherwise desirable method, or the existing political structure may be incapable of adaptation to new uses.

Perhaps the easiest and certainly the most obvious way for any unit of government to secure a desired public improvement is to persuade some other government to assume it as a public function. The transfer may be from a lower to a higher unit, or from a central to a subordinate government, but in either case it shifts responsibility and alters the tax base to be used for purposes of financing the function. Thus a State may pass on to the Federal Government responsibility for constructing a flood-control dam, thereby securing the desired capital investment from the greater revenue sources open to the larger jurisdiction; or it may save its own tax base by inducing a county or municipality to supply the capital. The basis for this shift of functions is usually financial, the argument being that the unit best able to support the undertaking—because of greater taxable resources, comparative freedom from legal restrictions, or smaller existing burdens—should be the one to perform the function. It does not follow, however, that the political unit best equipped financially to carry on a given service is necessarily the unit best able to administer that service efficiently.

In a number of cases, consequently, the grant in aid is a more desirable method of securing the necessary outlay for capital improvements. By this method part or all of the required capital may be supplied by one political unit while the administration of the function remains with another. The grant is always given by a central to a subordinate government, but may take a variety of forms. It may be for the purpose of encouraging certain functions in which the grantor is interested; it may be to stimulate experiment or to demonstrate either the benefits of a given function or a technique of intergovernmental cooperation; it may be designed to equalize financial differences among subordinate governments and make a stated minimum of services available to all the citizens of the larger jurisdiction; or it may be simply to assist the general finances of a subordinate unit. For the latter purpose the grant may be unconditioned, offered in support of governmental functions in general. It may also be given, however, to aid specific projects and may be made subject to various conditions designed to guarantee the efficient administration of the function in question.

Similar purposes may be secured by sharing with subordinate governments the proceeds of some centrally collected tax; or the tax base of the more able unit may be divided with the less able. A surcharge on centrally administered taxes has also been used to some advantage as a means of providing public capital for subordinate governments.

Another means of supplying capital for public improvements is through the use of credit. In many instances the smaller units of Government have been unable to finance public-works activities through inability to borrow, either because they could not carry the burden of debt charges or because there was no available financial institution equipped to act as fiscal agent. These difficulties might be overcome through the agency of a central government assisting in the flotation of bond issues or in the marketing of short-term credit. The central government might even go a step farther and assume all or part of the interest burden as a means of encouraging certain desired public-works activities; or it might use its superior credit facilities to secure for the subordinate unit a lower rate of interest on the money borrowed. The cost of borrowing might also be reduced for subordinate governments, and the marketability of securities increased, if the central agency could be induced to guarantee their debts; or the central government might provide discount facilities for the short-term paper of the lesser members of the hierarchy. Other possible devices for making credit readily available to subordinate governments for public improvements are banks for public loans and deposits, and credit corporations authorized to deal with governmental bodies.

There are some capital improvements affected with a public interest, such as housing, which need be under-

taken by public agencies only if private capital cannot be induced to enter the field: and by regulation of various factors, these may often be made attractive to private investors. Control of private associations or of trade practices, reductions in interest rates or public utility charges, the elimination of price disparities, or the equalization of competitive conditions are all within the sphere of governmental activity, and serve to direct the flow of private capital into enterprises which would otherwise have to be financed by Government agencies.

A unit of government may adopt, for purposes of financing a given project, any one or any combination of the methods discussed above. It may use different methods for different projects, or different methods for the same type of project at different times. The method of making capital available for investment in public enterprises is only part of the cost-allocation problem. It remains to determine the means of financing capital charges, and possible devices for shifting the burden of interest or repayment or both to the beneficiaries of the specific function.

Methods of Financing Capital Charges

Repayment of principal and/or interest on capital invested in public works may be expected from different groups, on one or more of the following grounds:

(*a*) A general benefit to the public at large;

(*b*) A special benefit to individual users of a facility or service;

(*c*) A special increment in the value of a specific property;

(*d*) A special benefit or advantage to a particular area or region. If the benefit is sufficiently diffused throughout the area of a political division, or the Nation as a whole, repayment may be from general taxation. The fee or charge is the device normally used to reach individual beneficiaries of a service or facility: the special assessment to reach special benefits to real property; and the special tax to reach the more diffused benefits enjoyed by a particular area or local subdivision.

These methods, it should be emphasized, refer to the financing of capital charges. In the preceding section methods of securing the initial capital were discussed. It should be a general rule, however, that the method of carrying the capital charges and what those charges are to include should be determined before the project is undertaken. For example, let us assume that a flood control dam is to be constructed with money loaned by the Reconstruction Finance Corporation. The extent of national interest in the project should first be determined, and the interest and amount to be repaid fixed accordingly. If the general benefit to the people as a whole is deemed sufficient to warrant the supplying of interest-free funds, the cost of the money to the Federal Government will come from general taxation. The principal of the loan, however, must be repaid within a term of years; and for this purpose a special assessment against the property protected from floods may be chosen. The political subdivisions within which such property lies should then enter into a repayment contract, and set up the machinery for collection of the special levy before the work of construction is begun. It is with this second phase of the problem—the means of securing from beneficiaries the repayment of capital charges—that this section is concerned.

General taxation.—General taxation can equitably be used for this purpose only when the area of benefit approximates closely the area of some political jurisdiction, or when for some clearly defined reason it is thought desirable to tax a broader or smaller group than that composed of direct beneficiaries. Some portion of the cost of a national highway system may well be taken from general public revenues as conferring a national benefit; and the cost of a municipal water system may reasonably be borne by the taxpayers of the municipality. An irrigation project, on the other hand rarely confers proportional benefits on the citizens of a given governmental unit, and the people of a county or a State should not be taxed to support a project from which only a portion of their number derive benefit unless there is sound reason for doing so. Equalization of financial burdens or the development of backward areas may be such a reason, but if so the policy should be clearly formulated.

Fees and charges.—Fees such as the automobile license fee, and charges such as those for irrigation water or hydroelectric power offer an important means of recoupment for special services to individuals, and may conveniently be used to carry a substantial proportion of the cost of certain types of public works. Whether fees and charges may be used to carry more than that proportion of the total cost of the project which may reasonably be assigned to the functions so recouped, however, is a question which can only be answered in terms of definitely announced policies and objectives. For example, the entire cost of Boulder Dam, including a $25,000,000 allocation for flood control and such elements of cost as might well be charged to navigation or desilting, is to be repaid from the sale of falling water for generation of hydroelectric power. While such a practice may in certain individual cases be justified, the benefits from nonvendible services are no less real than those arising from services which can readily be disposed of for cash, and the beneficiaries of the latter should not be made to pay for other increments in which they do not share.

In the use of all such charges to secure repayment of the cost of special services the economic justification of

the project is assumed. Unless a public-works project is economically sound, charges to individuals must be in excess of the value of the services rendered to them if the allocable costs are to be recovered. Where a project is not justifiable on economic grounds yet is desirable because of political or military advantages, only that proportion of the cost which may reasonably be assigned as benefit to special users should be recouped as such, the remainder being carried out of general State or National taxation as the case may be.

A device which has been found useful as a means of recovering from individuals the cost of special services is the contractual agreement, by means of which a large number of individuals using the same service may be represented as a corporation in their dealings with the Government. The advantages of this form of organization are two: The administrative problem is shifted in considerable part from the Government to the corporation; and it is possible by this method to make the group responsible as a whole rather than as individuals. The latter advantage should not be minimized, for the corporation is an effective means of reducing the moral risk, friction, and delay necessarily incident to governmental dealings with many individuals. The Bureau of Reclamation has made some use of this type of organization in connection with federally aided reclamation projects. In some cases these local corporations are vested with the taxing power, while in others funds for repayment of construction and maintenance charges are secured by contract with individuals.

Special assessments.—In the typical case of local benefits, except where fees and charges are applicable, compensation for direct gains to individuals must be secured by use of some device which includes the power to prevent a few recalcitrant people from delaying a project or shirking financial obligations. It is necessary, therefore, to have some means of levying special assessments that are a lien on real property.

The use of special assessments directly by the Federal Government is confronted by grave legal and political problems. It is usually assumed that the courts would interpret a special assessment as a direct tax, and the Constitution prohibits the Federal Government from levying direct taxes on property except as allocated among the States on the basis of population. Even if such assessments were construed as excises on the right to own land no means of escape would be provided, since the Constitution requires excises to be uniform throughout the United States.

States and subordinate governments, however, are under no such restrictions as to the use of special assessments, and they have been used extensively—especially by municipalities for financing such improvements as grading, curbs, sidewalks, roadways, sewers, and water mains. The States, too, have created various special improvement districts with power to levy assessments on property benefited by flood control, river regulation, storage reservoir, and reclamation projects. The Federal Government, by agreement, has made use of certain of these State agencies to secure the spreading of assessments to defray a portion of the cost of certain flood-control and irrigation projects. By entering into such agreements in advance of construction the Federal Government may make use of this method of securing repayment of any capital it may advance for public-works projects of a type which result in special local benefits.

In dealing with such special districts or with States or local units, however, the Federal Government must rely chiefly upon contracts, dependent on voluntary cooperation. The recent history of Boulder Dam should make unnecessary a detailed statement of the delay and sometimes inequitable compromises which one recalcitrant party to the contract may cause. Skill and advantageous position in bargaining play very important and often decisive roles in the determination of final financial policy.

The theory of the special assessment for a local improvement is that, in addition to the general benefit to the community accruing from the improvement, certain individual property owners enjoy a special benefit to their property. For example, the grading of a street, the construction of curbs and sidewalks, the construction of the original road pavement, and other improvements which add a special value to the abutting or directly affected land. It is the theory of the special assessment that this special increase in the value of land should be drawn upon to pay all or a portion of the cost of the improvement.

Urban experience with special assessments and improvement districts is illuminating in connection with the Federal problem of cost allocation but State experience with the larger scale regional taxing districts is of more practical value. Various States have created special taxing or improvement districts for flood control, river regulating, irrigation, land drainage and other purposes. Through State agencies they are available also under cooperative arrangements for use in connection with Federal projects.

In Ohio following the Dayton flood the Ohio conservancy law was enacted in 1914. Under this law conservancy districts can be set up for the following purposes: Flood control, channel improvement, reclamation of wet lands, and irrigation. They are given some control also over the utilization of the waters under their jurisdiction for power and water purposes.

A district can be created by the court of common pleas of the county or counties affected. If it is to embrace territory in several counties the judges of the court of common pleas all sit as a unit on the matter.

A petition to create a district can be filed by a municipal corporation in the area, 500 or a majority of the freeholders, or the owners of a majority of the property (either in terms of area or value). The court after a public hearing can grant the petition and determine the boundaries of the district.

A conservancy district is a public corporation having perpetuity, the power to tax, to issue bonds, and a superior right of eminent domain. The district is under a board of three men appointed by the court of common pleas with a term of office of 5 years. This board is to prepare plans and determine the costs of the needed works. These must be approved by the court of common pleas. A general tax of not more than one-tenth mill applicable to all property in the district can be levied to pay for the costs of the preliminary surveys and plans.

The costs of the improvements are to be distributed according to benefits received. The benefits are to be determined and the costs apportioned by three appraisers nominated by the board and appointed by the court of common pleas. Assessments may be levied against specific properties and against municipal corporations as political entities. Assessments are subject to review by the court of common pleas. Maintenance charges are also apportioned on the basis of benefit.

Up to the present time only two conservancy districts have been set up under this law, the Miami and the Muskingum Districts. In the Miami District the entire cost of the flood-protection project ($33,000,000) was assessed on the district on the basis of benefit. The Muskingum project is being developed largely with Federal funds and only a small portion is to be assessed on the district.

In the Miami District the board of appraisers ascertained benefits and damages to each property, relying chiefly on three basic factors: The degree of flood menace, the degree of protection provided by the project, and the value of the property. Practically complete protection was provided to all properties, so the second factor could generally be ignored.

The procedure for the determination of benefit is too elaborate to be presented in detail. Briefly, the appraisers ascertained flood areas on the basis of experience, the value of flood protection as a ratio to property values was determined, and specific benefits to each property were then estimated on the bases of degree of menace and value of property by tables of benefits which were applied uniformly. Numerous conditioning factors such as special protection to utilities and political subdivisions were also considered. The final assessments were proportional to the estimated benefits of $77,000,000. This project has been characterized as "an outstanding example of the equitable application of special assessments." [1]

A similar procedure is followed by river-regulating districts which have been established in New York State. Two such districts have been created, one for the Black River and one for the upper Hudson. The main function of such districts is the construction of storage reservoirs for river-regulating purposes.

The creation of such districts is subject to the control of the State water power and control commission. Any resident or property owner in a watershed, or any municipal corporation situated in whole or in part in the watershed, can petition the water power and control commission for the creation of a regulating district. After a showing of need at a public hearing, the commission can establish the district and determine its boundaries; such determination is subject to review by a writ of certiorari in the supreme court brought within 40 days by an individual resident or property owner, a municipal corporation, or the attorney general.

The river-regulating district is a public corporation having perpetual existence, power of eminent domain, power to tax, and the power to issue bonds. The governing board of the district consists of three members appointed by the governor. The regulating district must submit its general plans for development to the water power and control commission for approval. After such approval the detailed plans of dams and reservoirs must also be submitted to the commission for approval. After a public hearing the final decision of the commission is subject to review by the Supreme Court on a writ of certiorari.

The board has authority to estimate the costs of the proposed improvements and to apportion them on the properties and municipal corporations benefited.[2]

The assessments made by the board are subject to review in the same manner as are determinations of boards of assessors. Assessments can be made payable in a lump sum or annually at the discretion of the board. Assessments are paid as ordinary taxes. The maintenance costs are determined by the board every 10 years and are apportioned among the municipal corporations and properties according to benefits received.

In these two districts the primary purpose served by the reservoirs constructed has been that of maintaining low water flow for the benefit of developers of water power; and the major portion of the cost has consequently been assessed against these power-site interests.

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[1] A. R. Burnston: Special Assessments Procedure, p. 68.

[2] The board shall then apportion such cost, less the amount which may be chargeable to the State, among the public corporations and parcels of real estate benefited, in proportion to the amount of benefit which will inure to each such public corporation and parcel of real estate by reason of such reservoir.

In the upper Hudson district the Sacandaga Reservoir cost about $12,000,000. Of this amount 64 percent was assessed to industrial corporations, 31 percent to public-utility corporations, and only about 5 percent to municipalities. In the case of the Stillwater Reservoir in the Black River district the cost was $1,200,000 and the assessment, 37 percent to industrial corporations, 61 percent to utilities, and 2 percent to municipalities.

The special tax.—The special assessment and the special tax levied on a local area for a specific improvement are often indistinguishable. The special assessment may be levied on a special area of benefit and the apportionment of the special benefit based on the value of the individual properties. The same result might be secured by creating a special tax district. The special assessment is levied against increments in the value of specific properties in proportion to their estimated benefit. Thus the land deriving most benefit from a flood-control project would have the highest assessment. The special tax is levied uniformly on the property in a given area, and can only be equitably used when the benefits are quite generally diffused throughout the area.

With the special tax, as with the special assessment, the Federal Government can act only through contractual arrangement with subordinate governments.

Methods of Securing Effective Control

Means of controlling public-works expenditures must be treated as part of the general cost allocation problem because they are too intimately bound up with the question of finance to be isolated. Nor would isolation be desirable if it could be achieved. Administrative responsibility for public works is as important as financial responsibility, which may serve to determine it.

Broadly speaking, the source of capital will also be the seat of control in any project. If investment in private control will remain in private hands except where the public interest demands some degree of regulation, and any investment of public funds will be administered by the government that puts up the money. Certain checks, however, can be applied to such expenditures to minimize waste and to insure reasonably efficient machinery for repayment. One such check lies in the technology of accounts and audits, another in the conditions which may be attached to the grant in aid or which may be exacted by the bargaining process in return for a loan.

Although in terms of any given political philosophy a generally desirable locus of control such as central or local may be warranted, for practical purposes control must be determined by functional efficiency. The administration of any public investment, that is to say, should be in the hands of whatever public body can most efficiently carry out the purpose of the investment. This may or may not be the same public body which supplies all or most of the capital. Since, however, the investment of capital brings control if unhampered, the devices above referred to are often utilized to alter the seat of responsibility.

For example, only 30 percent of the construction cost of a project may be supplied by the Federal Government, but by means of conditions attached to the grant this 30 percent financial participation may secure the deciding voice in administration of the project; or the Federal participation may be restricted to a loan to be repaid with interest, but by contract with the borrower administrative control over the public work so financed may be secured. In other cases, however, the legal requirements relative to accounts and audits in the jurisdiction in which the project is located may be deemed sufficient to offset unequal administrative control resulting from unequal financial participation.

Special Development Authorities

There are many instances in which the present political subdivisions are not so organized as to facilitate most advantageously the development, financing, construction, and operation of desirable public works. No one of the existing political subdivisions may embrace the entire area that could be advantageously served by the undertaking. Often there is no unit in the area with the necessary administrative organization for the planning, construction, and operation of the development. The territory to be developed may embrace parts of two or more States. The most advantageous area for flood control, irrigation, soil conservation, port development, sewage disposal, electricity supply, or for other functions may not coincide with the boundaries of any political subdivisions. The existing units may not always be able to finance the operations. Consequently it has been necessary to devise new governmental instruments to carry on these functions. These new units have taken the form of special development authorities.

These special development authorities may be created by the Federal Government or by the States, but the Federal Government so far has created only one such agency, strictly defined, the Tennessee Valley Authority. This agency has been set up in a drainage basin involving parts of seven States. It operates as a Government-owned corporation, with wide powers in respect to planning and development, not only of water resources but of the whole social and economic life of the valley.[3] The Authority is of a character entirely different from anything which has preceded it, and its experimental features must be allowed for in determin-

[3] Planning and development functions of the Tennessee Valley Authority have been treated at length in a report of the National Resources Committee entitled "Regional Factors in National Planning and Development."

ing the division of costs and responsibilities relative to its public-works functions.

The Federal Government has financed the experiment. In actual practice, however, it has been found that various agencies of the basin States have cooperated in much of the work both in the time of their officers and by sharing certain costs through matching of funds, joint participation in demonstration activities, subsidies, and grants in aid. These State and local contributions are substantial but for the most part do not relate to construction projects such as dams which represent the principal items of Tennessee Valley Authority expenditure. Moreover, ability to pay has, up to the present time, been given relatively little weight in the distribution of joint programs.

An exceedingly intricate problem arises with reference to the allocation of benefits and the manner in which they may be apportioned among the different classes of individual users and governmental subdivisions.

Except in a very few cases of local financing such as the proposed bond issue for Chattanooga flood control, and in some cooperative efforts with State agencies, no efforts have been made to induce the political subdivisions affected to share in the costs of the Tennessee Valley Authority's major programs. Various State and county agencies are cooperating with the Authority at some expense of their own, but no attempt has been made to share the expense of flood control, navigation, electric-power development, or the economic program in any proportion to the benefits derived.

The desirability of the use of the Federal development authority depends to a large extent on what theory of division of costs is adopted for the type of works involved. Costs of power, irrigation, and potable water produced by Federal authorities can be allocated on a benefit basis; but the more diffused advantages of flood control, soil conservation, and navigation works cannot be so readily distributed on this basis. Of course, the temptation to establish development authorities in areas which do not require them under the equalization principle but which have sufficient political influence to secure them is an impediment to the operation of this principle.

For undertakings that are primarily a Federal concern and for those that are of an interstate nature the Federal authority possibly may be an advantageous form of organization. Before the use of this device is resorted to, however, the possibilities of other governmental instrumentalities should be considered thoroughly. There are also developments situated entirely in one State and in which the Federal Government only has a secondary interest. State-created development authorities might prove to be satisfactory for these undertakings. Further, legal difficulties may present themselves which would make it difficult to use the Federal authority.

The legal and functional hindrances that may possibly arise from the use of Federal authorities may make it necessary to rely upon State instruments. Authorities directly acting as State instrumentalities are created by special law or under the operation of a general law. Under a general law they are usually created by an existing State agency on a showing of local need, and the controlling board is appointed by the Governor or some other State appointing agency. Plans, construction, and financing may be made subject to control by some related State bureau. River regulating districts in New York and the Central Valley Authority in California are examples of this type. Such a method of organization tends to promote development in accord with State administrative standards and in conformity with unified State plans. Where the function being performed by the authority has a significance beyond its territorial confines this method of organization may be effective in representing the general public interest. Port districts are an example of this; the port improvement is beneficial to the hinterland.

Illustrations of the State authority functioning as an independent organization are the board of trustees of the Sanitary District of Chicago, the Seattle Port Commission, and the districts organized under the Ohio Conservancy District law. They normally manifest their independence by having their boards locally chosen and by referendum approval of the tax levy. If this type of local authority is established under a general law some organ of the Government has to be vested with the administrative task of setting it up.

The Passaic Valley Sewerage Commission of New Jersey and the East Bay Municipal Utility District of California represent a third type of organization, the federative. In this form the authority is primarily the agent of the municipalities that compose it. Although the authority is, of course, the legal creature of the State, it is actually the agent of the constituent municipalities and it is responsible to them. The component municipalities determine whether or not they care to enter upon the undertaking. Members may be slow to determine upon participation in the development, and such a determination even by a key municipality may only come after the public works have been designed and constructed to meet the needs of the original participants. Often the directing board is composed of ex-officio officers of the member cities. In some instances all the financial support comes in the form of free-will offerings from the members.

Several different methods of financing have been utilized: General property taxes, special assessments, grants from the State, and voluntary contributions from the member bodies. Original construction may be con-

summated by means of bonds guaranteed by the income from specific improvements, by the general credit of the authority, or by the credit of the State. The type of financing is to a degree dependent upon the type of function that is to be performed.

The functions to be performed will determine to a large extent the form of organization best suited for a given special development authority. Nevertheless certain principles generally applicable can be stated concerning the desirable form of organization. Centralization of control over and responsibility for those authorities in the States or the National Government is generally to be desired. Authorities that affect the broad interests of a large number of people living in an extensive area, that have ramifications extending beyond their boundaries, or to which the State has made a large contribution should be set up and operated under the supervision of the related State departments. The appointive board is to be preferred; membership should not be restricted to the area of the district, though appointment of residents only will sometimes be desirable. All major financial contributors should be represented adequately. The related State departments concerned (conservation, public works, public service, agriculture, etc.) should have broad control over plans and their execution. The fiscal activities should be under the supervision of the appropriate State departments.

Government-owned Proprietary Corporations

The Government-owned proprietary corporation may be defined as "a corporation engaged in the operation of an economic undertaking in which the Government holds either the entire or a controlling interest. The interest may be exercised through ownership of a majority or a large part of the stock of the corporation or it may be exercised directly without the device of stock ownership."[4] Corporations of this sort differ from municipal corporations in that the latter involve the idea both of citizens and of territory; they are conceived of as treating the many as one, qualified by territory.[5] The Government-owned proprietary corporation may be a device for effectively organizing public works that are expected ultimately to be self-sustaining, for example, water supply, electricity, toll bridges.

Such Government-owned corporations are generally believed to afford advantageous administrative machinery for proprietary functions of the Government. They may be an effective device for removing the operation of the undertaking from partisan politics. Generally this has happened; but there is no absolute assurance that the spoilsman will not make his influence felt. Some writers believe that such corporations are comparatively free from the bureaucratic methods of Government departments. And they are not, it is true, always subject to the same financial limitations as are ordinary Government services. Appropriations would not ordinarily lapse at the end of the fiscal year; consequently there is no pressure to consume appropriations. The corporation can secure loans from private sources to tide them over a difficult period if they are able to find a willing lender. Freedom from the normal methods of Government accounting generally is granted to this type of organization; but this cannot be regarded as an unmixed blessing since independence may be subject to abuse. The normal methods of Government accounting and auditing do not adequately fit the needs of such undertakings; but this fact does not prove that public corporations should be entirely free from external fiscal controls. Finally, such corporations are subject to suit in almost the same manner as are private corporations and they are subject to Federal taxation under the Constitution of the United States.

Interstate Compacts.

As has been indicated not all public-works developments in which the Federal Government might have an interest can be executed by one single State acting independently. The furnishing of an adequate water supply to a metropolitan area may involve relationships between municipal corporations in several States, and the source of water supply may also be interstate in character. Flood control, irrigation, and power production may involve the control of a stream the water of which may be subject to the jurisdiction of a number of States, and consequently an equitable prorating of its flow must be arrived at before the work can be undertaken. From a purely administrative point of view it is quite possible that in some instances these interstate problems could be handled most advantageously by Federal authorities. But it must be remembered that the mere fact that a given matter is an interstate problem furnishes no juristic basis for Federal action relative to it. Some of the legal difficulties involved in the idea of Federal development authorities have been alluded to before. Although the Federal authority may possibly be an advantageous device for handling developments affecting more than one State, it is possible also that in some instances its use may be legally or politically unfeasible. Under such circumstances it might be necessary for the States concerned to make use of an alternative method of joint action, the interstate compact. The Constitution provides that "no State shall enter into any treaty, alliance, or confederation"[6] and

[4] John Thurston, Government Owned Proprietary Corporation, 21 Virginia Law Review 331.

[5] D. P. Field, Government Corporations: A Proposal, 48 Harvard Law Review, 775–778.

[6] Article 1, section 10, clause 1.

that "no State shall, without the consent of Congress, enter into any agreement or compact with another State, or with a foreign power."[7] There have been no cases drawing the line between forbidden treaties, alliances, and confederations and permitted agreements and compacts. Probably the terms treaty, alliance, and confederation refer to political agreements.

The process of arriving at an interstate compact may be very long drawn out. At the worst it might involve the following steps: (1) Congressional consent to enter upon negotiations; (2) legislative authorization of negotiations and naming negotiators; (3) actual meeting of the delegates and negotiating the agreement; (4) legislative ratification; and (5) congressional approval. The first of the above steps is generally omitted. A number of compacts have been made in the form of the passage of identical legislation without previous legislative authorization by the States. Some interstate compacts have taken an unusually long period of time to negotiate. It is difficult to see how this process can be speeded up. If a group of States with a common problem do not arrive at a modus operandi, the reason may be that the problem is not of pressing concern to them and consequently under such circumstances it would not be meritorious of Federal assistance. In recent years the United States has been a party to a number of compacts relating mainly to water diversion. Where large interests are concerned and substantial Federal grants are anticipated it is desirable that the United States be a party to the undertaking.

The Constitution would seem to necessitate congressional approval of all such undertakings; but this seems to be subject to the proviso that if no national interest is involved, congressional approval may, in the absence of disapproval, be assumed.[8] Of course, if an agreement is entered upon for the setting up of an authority for the purpose of securing a Federal grant-in-aid there would be such an interest. Congressional approval is the least difficult step in the whole process; this has never been refused, although in one instance it took 24 years to secure action.[9] In a number of instances congressional approval has been forthcoming before local action, and in certain cases Congress has by legislation given blanket approval to all future agreements of a given type. At least 18 interstate agreements have been entered into without the approval of Congress.

By a process of reciprocal legislation interstate cooperation can be attained without any form of compact. Although it is possible that congressional approval is not absolutely required for all compacts related to public-works development, the amount of money involved and the problem of the legal indebtedness presented make congressional approval desirable. Compacts involving navigable waters may possibly present a more difficult problem. It may be wise for Congress to authorize general approval in advance of certain types of interstate agreements if some Federal administrative agency approves of their terms. The Secretary of the Interior or the Secretary of State might be given the power to approve such compacts. Of course, this presents the question of the competence of Congress to delegate legislative power especially if no clear statement of standards is included in the delegation of authority.

Interstate compacts have been used most commonly for the determination of State boundaries. The next most frequent use of them has been to regulate the flow of interstate streams. These are of significance in relation to irrigation, power, water supply, and flood-control works. Minnesota, North Dakota, and South Dakota have entered into a compact to regulate floods on the Red River of the North. The Colorado River compact was essential to the construction of Boulder Dam. At least seven agreements have been made dealing with the construction and maintenance of bridges across interstate streams. A number of these undertakings have been quite simple and informal, often actually being arranged by the State highway departments.

The method of interstate compact has been used to create special development authorities. The most notable of these is the Port of New York Authority which was created by an agreement between the States of New York and New Jersey in 1921. The Authority proposed a general scheme of development for the port area, and in 1923 the scheme was approved by the two States. The Authority has constructed three bridges and a freight terminal. It has another bridge and a tunnel under construction with loans from the Public Works Administration. The Holland Tunnel also has been transferred to its jurisdiction. The Authority has not been successful, however, in the coordination of rail facilities in the port area. As for finances, it receives only a small grant from the two States for administrative purposes; it has no taxing power; nor can it pledge the credit of the States. It can issue bonds secured by the revenues resulting from the works constructed with the proceeds. One possible reason why the Authority has not had greater success may be that it has not had taxing power or the competence to pledge the credit of the State.

Chicago has been even less successful than New York in securing interstate cooperation for the control of its port. In 1921 the States of Indiana and Illinois created an interstate harbor commission to report on an interstate harbor in a limited area. Ten years later the

[8] *Virginia* v. *Tennessee* (148 U. S. 503, 521).

[7] Article 1, section 10, clause 3.

[9] See Northcutt Ely, Oil Conservation Through Interstate Agreement, p. 390. (Delaware-Pennsylvania boundary.)

two States created the Chicago Regional Port Commission to report on the development of a permanent interstate port authority. In 1933 Indiana passed a law authorizing the formation of a compact with Illinois to create the Interstate Port Authority of Illinois and Indiana. The legislature of Illinois has only voted to continue to cooperate in the study of the problem.

Although the interstate compact does not at present appear to be the most advantageous instrument for promoting joint action on the part of States with a common public-works problem, it may in the future become a good deal more useful. The machinery of negotiation is set in motion with difficulty. It may be almost impossible to get all States concerned to agree to a really workable scheme. The process of ratification presents further difficulties. But it is possible that there are situations wherein its use will be advantageous because of either the legal inability or the political unwillingness of the Federal Government to create authorities. Consequently it would be desirable to take steps that might facilitate the formation of interstate compacts. The States might find it advantageous to create standing commissions to negotiate interstate agreements. It is possible that not all such agreements relating to public works need congressional approval; but because of the large interest involved at times it seems desirable to secure congressional approval. It may be feasible for Congress to give that approval in advance in the case of certain types of compacts provided that the compact is approved by some administrative authority. The interstate compact may prove to be highly advantageous in the future if appropriate Federal action is taken to facilitate the formulation of such agreements.

Type of grant	Date established [1]	Amount appropriated for 1936	Annual appropriation authorized	Basis of apportionment among States		
				Uniform lump sum per State	Administrative discretion	In proportion to—
I. APPROPRIATIONS FOR ORDINARY GRANTS AND COOPERATION						
INDEPENDENT OFFICES						
Social Security Board						
Old-age assistance	Aug. 14, 1935	[2] $24,660,000	[4]		Estimate by Board [5]	
Unemployment compensation administration	do	[6] 2,250,000	$49,000,000		do.[7]	
Aid to dependent children	do	[8] 5,000,000	[4]		do.[9]	
Aid to the blind	do	[10] 2,000,000	[4]		do.[12]	
Veterans' Administration						
State and Territorial homes for disabled soldiers and sailors.	Aug. 27, 1888	[13]				$120 per inmate
DEPARTMENT OF AGRICULTURE						
Agricultural experiment stations	Mar. 2, 1887	[14] 1,515,000	[15] 30,000	[15] $30,000	[18]	
Do	Feb. 24, 1925	2,880,000	[15 17] 60,000	60,000	[19]	
Agricultural research	June 29, 1935	600,000	[15] 3,000,000			Rural population
Cooperative dairy and livestock experiments	Feb. 4, 1928	[18]			[20]	
Cooperative agricultural extension work	May 8, 1914 May 22, 1928 June 29, 1935	[26] 7,652,000 8,000,000	[22 23] 480,000 [22 23 24] 4,100,000 980,000 500,000 [27] 12,000,000	[22] 10,000 [25] 20,000 [25] 20,000	 [18] 	 Rural population Rural population Remainder according to farm population.
Additional cooperative agricultural extension work.	May 17, 1935	1,000,000			[29]	
Cooperative conservation of agricultural land resources.[30]	Feb. 29, 1936		500,000,000		Sum necessary to carry out State plan.[31]	
Cooperative forest fire protection	Mar. 1, 1911	1,578,632			[32]	
Cooperative distribution of forest planting stock	June 7, 1924	56,379	[33] 100,000		[34]	
Forest roads and trails	Nov. 9, 1921	[35] 6,500,000	[36]		[37]	Area and value of land owned by Federal Government within national forests.
Highways [39]	July 11, 1916	[40] 40,000,000				⅓ rural and star route mileage, ⅓ area, ⅓ population.[41]
DEPARTMENT OF THE INTERIOR						
Colleges for agriculture and mechanic arts	Aug. 30, 1890 June 29, 1935	980,000	980,000 [42] 1,500,000	[44] 50,000 [44] 20,000		 Population
Office of Education—Vocational education						
Cooperative vocational education in agriculture	Feb. 3, 1917	[33 45] 3,027,000	3,000,000	[43]		Rural population [47]
Cooperative vocational education in trade, home economics, and industrial subjects	do	[33 45] 3,050,000	3,000,000	[43]		Urban population [47]

See footnotes at end of table.

APPENDIX A

grants-in-aid to States [1]

Conditions of apportionment			Maximum grant by Federal Government	Federal administrative agency	Remarks	Citation
Matching required?	Percent required from State	Specified uses of grants				
Yes	50	Old-age assistance	$15 per beneficiary	Social Security Board	5 percent of funds may be used for administrative purposes.	49 U. S. Stat. 620, §§ 1, 3; Public, No. 440, 74th Cong.; Public, No. 739, 74th Cong.
No		Administration of unemployment compensation laws.		do		49 U. S. Stat. 626, §§ 301, 302; Public, No. 440, 74th Cong.; Public, No. 739, 74th Cong.
Yes	66⅔	Aid to dependent children	$4 and $6 [10]	do		49 U. S. Stat. 627, §§ 401, 403; Public, No. 440, 74th Cong.; Public, No. 739, 74th Cong.
Yes	50	Aid to the blind	$15 per beneficiary	do	5 percent of the funds may be used for administrative purposes.	49 U. S. Stat. 645, §§ 1001, 1003; Public, No. 440, 74th Cong.; Public, No. 739, 74th Cong.
Yes	50	Care of disabled soldiers and sailors.		Administrator of Veterans' Affairs.		U. S. Code, title 24, § 134.
No		Pay necessary expenses of researches or experiments bearing directly on the agricultural industry.		Secretary of Agriculture.	Not more than 5 percent of each annual appropriation is to be applied to the purchase, erection, preservation, or repair of any building, or to the purchase or rental of land.	U. S. Code, title 7, §§ 369, 375, 386a, 386c, 386e; 49 U. S. Stat. 250.
No		Pay necessary expenses of investigations or experiments on agricultural products.		do	Not more than 10 percent of each annual appropriation is to be applied to the purchase, erection, preservation, or repair of any building, or to purchase or rental of land.	U. S. Code, title 7, §§ 370, 375, 386a, 386c, 386e; 49 U. S. Stat. 250.
Yes	50	Research into laws and principles underlying basic problems of agriculture in its broadest aspects.		do		49 U. S. Stat. 437, §§ 3, 5; 49 U. S. Stat. 582.
Yes	([21])	Experiments in dairying and livestock industries and products.		do		U. S. Code, title 7, §§ 385, 385a.
No		Cooperative extension work in agriculture and home economics.		do	At least 80 percent of the grants is to be used to pay salaries of extension agents in counties, being divided in a fair proportion among men and women.	U. S. Code, title 7, §§ 343, 343a, 386b, 386c, 386f; 49 U. S. Stat 252. 49 U. S. Stat. 438, § 21; 49 U. S. Stat. 582.
Yes	50					
No						
No [25]						
No		Additional cooperative agricultural extension work.		do	Funds may be used for employment of specialists in economics and marketing.	49 U. S. Stat. 252.
		Promote the conservation and profitable use of agricultural land resources.		do		Public, No. 461, 74th Cong.
Yes	[22] 50	Forest-fire protection		do		U. S. Code, title 16, § 563; 49 U. S. Stat. 264.
Yes	[24] 50	Forest planting stock		do		U. S. Code, title 16, § 567; 49 U. S. Stat. 264
([23])		Survey, construction, reconstruction, and maintenance of forest roads.[26]		do		U. S. Code, title 23, § 23; 49 U. S. Stat. 281.
Yes	[42] 50	Highways	25,000 per mile [43]	do	No more than 60 percent of the grants is to be spent on primary highways without approval of the Secretary. Items for engineering, inspection, and contingencies are not to exceed 10 percent of cost. 2½ percent of appropriations may be used for administration and research.	U. S. Code, title 23, §§ 12, 12a, 21, 41; 49 U. S. Stat 272.
No		Instruction in agriculture, mechanic arts, English language, and branches of mathematical, physical, natural, and economic science.		Secretary of Interior		U. S. Code, title 7, §§ 322, 386. 49 U. S. Stat. 439; 49 U. S. Stat 585. 49 U. S. Stat. 439.
Yes	[45] 50	Payment of salaries of teachers, supervisors, directors of agricultural subjects.		do		U. S. Code, title 20, §§ 12, 19.
Yes	[45] 50	Payment of salaries of teachers of trade, home economics, and industrial subjects.		do	No more than 20 percent of appropriation to be spent for salaries of teachers in the field of home economics.	U. S. Code, title 20, §§ 13, 19

See footnotes at end of table.

Authorized Federal grants-in-

Type of grant	Date established [2]	Amount appropriated for 1936	Annual appropriation authorized	Basis of apportionment among States: Uniform lump sum per State	Basis of apportionment among States: Administrative discretion	Basis of apportionment among States: In proportion to—
I. APPROPRIATIONS FOR ORDINARY GRANTS AND COOPERATION—continued						
DEPARTMENT OF THE INTERIOR—continued						
Office of Education—Vocational education—Con.						
Cooperative vocational education of teachers	Feb. 23, 1917	[3] [4] 1,060,000	1,000,000	[5]		Population [6]
Further cooperative vocational education	May 21, 1934	[7] 3,000,000	[8] 3,000,000	[9]		⅓ farm population [10]; ⅓ rural population [11]; ⅓ nonfarm population [12]
Cooperative vocational education (Hawaii)	Mar. 10, 1924	30,000	30,000			
Cooperative vocational education (Puerto Rico)	Mar. 3, 1931	100,000	105,000			
Cooperative vocational rehabilitation	June 2, 1920 Aug. 14, 1935	[13] 1,050,833 350,000	[14] 1,005,000 [15] 1,938,000	[16] [16] [17]		Population [18]
Cooperative vocational rehabilitation, District of Columbia	Feb. 23, 1929	15,000	15,000			
DEPARTMENT OF LABOR						
Social Security Maternal and child welfare	Aug. 14, 1935	1,580,000	3,800,000	20,000	$980,000 on basis of need [19]	$1,800,000 on basis of live births
Crippled children	do	1,187,000	2,850,000	20,000	Remainder on basis of need. [20]	
Child welfare	do	625,000	1,500,000	10,000		Remainder on basis of rural population
U. S. Employment Service	June 6, 1933	[21] 3,200,000	[22] 3,000,000			Population
TREASURY DEPARTMENT						
Social Security Public health	Aug. 14, 1935	3,333,000	8,000,000		Estimate by Surgeon General [23]	
Education of blind	Mar. 3, 1879	75,000	75,000			Number of pupils in public institutions for education of blind
NAVY DEPARTMENT						
State marine schools	Mar. 4, 1911	[24] 100,000				Match sum appropriated by States or municipalities.
WAR DEPARTMENT						
National Guard	June 3, 1916	33,987,323				Number of enlisted men in active service in National Guard [25]
II. APPROPRIATIONS FOR EMERGENCY GRANTS						
Federal emergency relief	May 12, 1933	[26]			[27]	
Federal emergency administration of public works [28]	June 16, 1933	[29]			Of President	
Loans or grants for public works projects	do	[30]			do	
Emergency construction of public highways	do	[31]				⅓ population—⅓ as follows: ⅓ rural and star route mileage, ⅓ area, ⅓ population
Highways, roads	Apr. 8, 1935	[32]				do
Grade crossing elimination	do	[32]				½ population—½ Federal aid highway mileage, ½ railroad mileage.
Public works	do	[33]				

See footnotes at end of table

aid to States—Continued

Conditions of apportionment			Maximum grant by Federal Government	Federal administrative agency	Remarks	Citation
Matching required?	Percent required from State	Specified uses of grants				
Yes	[48] 50	Preparation of teachers [51]		Secretary of Interior		U. S. Code, title 20, §§ 14, 1.
Yes	[48] 50	Payment of salaries of teachers, supervisors, and directors of agricultural subjects.		do		U. S. Code, title 20 §§ 15d, 19; 49 U. S. Stat. 211.
	[48] 50	Payment of salaries of teachers, supervisors, and directors of home economics subjects.				
		Payment of salaries of teachers, supervisors, and directors of trade and industrial education subjects.				
Yes	[48] 50	Payment of salaries of teachers, supervisors, and directors of agricultural, home economics, and trade and industrial education subjects.		do		U. S. Code, title 20, §29; 49 U. S. Stat. 211.
Yes	[48] 50	([50])		do		U. S. Code, title 20, §30; 49 U. S. Stat. 212.
Yes	50	Vocational rehabilitation of persons disabled in industry or otherwise and their placement in employment.		do		U. S. Code, title 29, §§31, 32, 45; 49 U. S. Stat. 211; Public, No. 739, 74th Cong.; 49 U. S. Stat. 633; Public, No. 440, 74th Cong.
Yes	50	Vocational rehabilitation and return to employment of any disabled resident of the District of Columbia.		do		45 U. S. Stat. 1260; 49 U. S. Stat. 212.
Yes	50	Promote health of mothers and children.		Secretary of Labor		49 U. S. Stat. 629, §§501, 502, 504; Public, No. 440, 74th Cong.
Yes	50	Services for crippled children		do		49 U. S. Stat. 631, §§511, 512, 514; Public, No. 440, 74th Cong.
Yes	([52])	Public welfare services for protection and care of children.		do		49 U. S. Stat. 633, §521; Public, No. 440, 74th Cong.
Yes	[53] 50	Establishment and maintenance of systems of public employment offices.		Director of U. S. Employment Service, under Secretary of Labor.		U. S. Code, title 29, §49d; 49 U. S. Stat. 104.
		Public health services		Surgeon-General, Public Health Service ([55]).		49 U. S. Stat. 634, §§ 601, 602; Public, No. 440, 74th Cong.
		Manufacturing and furnishing embossed books for blind and tangible apparatus for their instruction, being distributed among public institutions for education of the blind.		American Printing House for the Blind.	$10,000 of the annual appropriation is income from a trust fund of $250,000 set up in 1879.	U. S. Code, title 20, §§ 101, 102; 49 U. S. Stat. 235.
Yes	50	Maintenance and support of State or municipal marine schools.	$25,000 per school	Secretary of Navy		U. S. Code, title 34, § 1122; 49 U. S. Stat. 402.
([71])		Expenses of National Guard authorized by law.		Secretary of War		U. S. Code, title 32, §§ 21; 22; 49 U. S. Stat. 138.
([7])		Defray cost of furnishing relief and work relief and relieve hardship and suffering due to unemployment.	No more than 15 percent of total appropriation to go to 1 State.	Federal Emergency Relief Administrator.		U. S. Code, title 15, § 724; 49 U. S. Stat. 115.
		Construct, finance, or aid in construction and financing of public works projects, acquire property in connection with construction of such projects, aid in railroad maintenance, completion of annex to Library of Congress.		President, through Federal Emergency Administrator of Public Works.		U. S. Code, title 40, §403; 48 U. S. Stat. 275; 49 U. S. Stat. 115; 49 U. S. Stat. 119, §12; Public, No. 739, 74th Cong.
Yes	All but 45 percent of cost of project.	Construct, repair, or improve public works.		do		*Ibid.*
No		Emergency construction on Federal aid highway system; emergency construction on secondary or feeder roads.		do	No funds to be used for acquisition of land, right-of-way or easement in connection with any railroad grade elimination.	U. S. Code, title 40, §404; 48 U. S. Stat. 275; 49 U. S. Stat. 119, §12.
No		Highways, roads, streets		President [76]		49 U. S. Stat. 115.
No		Elimination of grade crossings		do [76]		Do.
([77])		Public Works projects [78]		do		Do

See footnotes at end of table.

Authorized Federal grants-in-

Type of grant	Date established [2]	Amount appropriated for 1936	Annual appropriation authorized	Basis of apportionment among States		
				Uniform lump sum per State	Administrative discretion	In proportion to—
III. GRANTS IN NATURE OF SHARED REVENUES [1]						
Forest funds	May 23, 1908					25 percent of receipts from national forests in State.
Payment to Oklahoma from oil and gas royalties, south half of Red River	Mar. 4, 1923	12,000				37½ percent of royalties.
Payments to certain counties in Oregon in lieu of taxes on Oregon and California land grants.	July 13, 1926	316,010				Amount of taxes accruing if land had been privately owned.
Revenues from Coos Bay wagon-road-grant lands and timber.	Feb. 26, 1919	3,000				25 percent of net receipts from sale of land and timber in State.
Revenues from sale of public lands	Mar. 3, 1893	3,291				5 percent of proceeds from sale of Federal lands in State.
Revenues from mineral leases	Feb. 25, 1920					37½ percent of receipts from mineral leases in State.
Revenues from wildlife refuges [4]	June 15, 1935					25 percent of receipts from wildlife refuges in State.
Payments to States under Federal Water Power Act	June 10, 1920					37½ percent of charges arising from licenses.

[1] This table is based on provisions effective for the fiscal year 1936.
[2] Date of approval of bill.
[3] $85,000,000 is appropriated for 1937. Of this "such amount as may be necessary shall be available for grants. * * * for any period in the fiscal year subsequent to Mar. 31, 1936 * * *."
[4] Sum sufficient to carry out purposes of title.
[5] Estimate is based upon (*a*) quarterly State estimate of expenditures, (*b*) number of aged individuals, and (*c*) "such other investigations as the Board may find necessary."
[6] $29,000,000 is appropriated for 1937. Of this "such amount as may be necessary shall be available for grants * * * for any period in the fiscal year 1936 from and after Jan. 1, 1936 * * *."
[7] Estimate is based upon (*a*) population, (*b*) estimate of number of persons covered by the State law and the cost of proper administration of such law, and (*c*) "such other factors as the Board finds relevant."
[8] $35,000,000 is appropriated for 1937. Of this "such amount as may be necessary shall be available for grants * * * for any period in the fiscal year 1936 subsequent to Mar 31, 1936 * * *."
[9] Estimate is based upon (*a*) quarterly State estimate of expenditures, (*b*) number of dependent children, and (*c*) "such other investigation as the Board may find necessary."
[10] Where more than 1 dependent child is in the same home, the Federal Government will pay a maximum of ⅔ of $18 for 1 and ⅔ of $12 for each of the others.
[11] $8,000,000 is appropriated for 1937. Of this "such amount as may be necessary shall be available for grants * * * for any period in the fiscal year 1936 subsequent to Mar 31, 1936 * * *."
[12] Estimate is based upon (*a*) quarterly State estimate of expenditures, (*b*) number of blind in State, and (*c*) "such other investigations as the Board may find necessary."
[13] No separate appropriation was made. The appropriation was included with others for the Veterans' Administration.
[14] $75,000 was appropriated for payments to Alaska, Hawaii, and Puerto Rico in 1936.
[15] For each State and Territory.
[16] Appropriations for Alaska to be based upon estimates of Secretary of Agriculture of ability of the Territory to make effective use of the funds. $12,000 was appropriated for these purposes in 1936.
[17] In addition to amount received on Feb. 24, 1925. Grants to Hawaii will not equal $90,000 until 1941, and to Puerto Rico until 1944. See also footnote 16.
[18] 60 percent of the annual appropriations for this purpose are allotted to the States, Alaska, Hawaii, and Puerto Rico. Annual appropriations authorized increase from $1,000,000 in 1935 to $5,000,000 in 1940 and thereafter.
[19] This appropriation was originally made to finance activities to be carried on in cooperation with the South Carolina Agricultural Experiment Station, and includes experiments promoted by the Bureaus of Plant Industry, Chemistry and Soils, and Dairy Industry. In recent years appropriations for these purposes are distributed in the respective budgets of these Bureaus and are carried on as a part of the regular Bureau activities.
[20] Annual appropriations of sums necessary to enable the Secretary of Agriculture to carry on cooperative experiments in dairying and livestock industries are authorized.
[21] "Cooperate"—No percent specified.
[22] Plus sums needed to extend benefits of provisions to Hawaii and Puerto Rico.
[23] This is a permanent annual appropriation.
[24] An additional appropriation of $1,580,000 was made for the fiscal year 1936 for distribution upon the same terms and conditions, and under the same supervision as this $4,100,000.
[25] Includes Territory of Hawaii.
[26] This sum includes the permanent appropriations of $480,000 and $4,100,000 authorized by §343.
[27] The appropriation is to be increased by $1,000,000 each year until it reaches $12,000,000 in 1940.
[28] However, these allotments will be available to the States and Hawaii only if they comply with the provisions with reference to offset of appropriations (others than these) r agricultural extension work.
[29] To be allotted and paid by the Secretary of Agriculture to the States and Hawaii in such amounts as he may deem necessary to accomplish such purposes.
[30] Applicable to all States, Alaska, Hawaii, and Puerto Rico.
[31] The Secretary shall take into consideration the acreage and value of the major soil-depleting and major export crops produced in the respective States during a representative period and the acreage and productivity of land devoted to agricultural production (including dairy products) in the respective States during a representative period.
[32] Secretary of Agriculture authorized to enter into agreements for cooperative fire protection on such conditions as he deems wise. Amount spent in any State in any fiscal year is not to exceed amount spent by that State for the same purpose in that year.
[33] Maximum.
[34] Secretary of Agriculture is authorized and instructed to cooperate with States in the procurement, production, and distribution of forest seeds and plants under such conditions an l requirements as he may prescribe. Amount spent in any State in any fiscal year is not to exceed amount spent by that State for the same purpose in that year.
[35] $10,000,000 was authorized for 1936, but only $6,500,000 was appropriated. However, Secretary of Agriculture is directed to apportion $10,000,000 among the States, Alaska, and Puerto Rico. See also footnote 75.
[36] Of the sums appropriated for forest roads and trails the Secretary of Agriculture is directed to spend all but 50 percent, providing the 50 percent does not exceed $3,000,000, for any fiscal year on roads and trails of primary importance to the State (including Alaska, and Puerto Rico), counties or communities, within, adjoining, or adjacent to, the national forest.
[37] Secretary of Agriculture is to determine area and value of Government-owned lands from such information, investigation, sources, and departments as he may deem most accurate. This information serves as a basis for apportioning funds for roads of primary importance to States, etc. Funds for roads of primary importance to forests are apportioned on the basis of need.
[38] Secretary of Agriculture may accept cooperation of States, Territories, and civil subdivisions, but shall not require it.
[39] Hawaii is given highway grants also.
[40] $125,000,000 is authorized. The Secretary of Agriculture is directed to apportion funds on the basis of the authorized sum.
[41] No State is to receive less than ½ of 1 percent of allotment for each year.
[42] Minimum. When State contains unappropriated public land and nontaxable Indian lands exceeding 5 percent of total estimated cost plus percentage of such cost equal to of percentage the area of such lands bears to total area of State.
[43] Exclusive of costs of bridges of more than 20 feet clear span. Until original 7-per cent system (original Federal-aid system) shall be surfaced the aid is limited to $15,000 per mile. Maximum for public-land States is increased in proportion to increased percentage of Federal aid described in footnote 42.

aid to States—Continued

Conditions of apportionment			Maximum grant by Federal Government	Federal administrative agency	Remarks	Citation
Matching required?	Percent required from State	Specified uses of grants				
		Public schools and public roads in counties in which forest is situated.		Secretary of Agriculture.	No amount is to be paid to any State for any county which amount is equal to more than 40 percent of the total county income from all other sources.	U. S. Code, title 16, § 500
		Construction and maintenance of public roads, support of public schools and other public educational institutions.	Receipts covered into the Treasury.	Secretary of the Interior.	Paid in lieu of all State and local taxes.	U. S. Code, title 30, §§ 191, 233; 49 U. S. Stat. 181.
		Prorated among State, county, port districts, school districts, and other civil subdivisions of counties.	do	do	Paid in lieu of taxes that would have accrued for years 1916–26, had the lands been privately owned.	44 U. S. Stat. 916, § 5; 49 U. S. Stat. 181; Public, No. 739, 74th Cong.
		Common schools, roads, highway, bridges, and port districts.		do		40 U. S. Stat. 1180, § 5; 49 U. S. Stat. 181.
		Public schools, roads and improvements.	Receipts covered into the Treasury.	do		2 U. S. Stat. 226, § 2; 49 U. S. Stat. 180; Public, No. 739, 74th Cong.
		Construction and maintenance of public roads, support of public schools and other public educational institutions.		do		U. S. Code, title 30, § 191.
		Public schools and roads		Secretary of Agriculture.		49 U. S. Stat. 383, § 401.
				Federal Power Commission.	Licenses are for occupancy and use of national forests, national parks, public lands, and national monuments. The 37½ percent goes to the State within whose boundaries the forest, etc., are located.	U. S. Code, title 16, § 810.

[44] Hawaii is entitled to share these benefits.
[45] Appropriations authorized increase from $500,000 in 1937 to $1,500,000 in 1939.
[46] An additional $27,000 is appropriated to provide the minimum allotment for the States.
[47] Minimum allotment to any State for any fiscal year is $10,000; population figures used do not include population of outlying possessions.
[48] In addition to matching the grants for payment of salaries, the States and local communities must bear the cost of instruction supplementary to the instruction in agriculture trade, home economics, and industrial subjects.
[49] An additional $50,000 is appropriated to provide the minimum allotment for the States.
[50] An additional $90,000 is appropriated to provide the minimum allotment for the States and Territories.
[51] Preparing teachers, supervisors, and directors of agricultural subjects and teachers of trade and industrial and home economics subjects.
[52] An additional $84,603 is appropriated to provide the minimum allotment for the States.
[53] Through fiscal year 1937. $5,000 of this is for Hawaii.
[54] Minimum allotment to any State or Territory for each of these purposes is $5,000 for any fiscal year.
[55] Population figures used exclude those of the insular possessions.
[56] Of sum authorized to be appropriated, $30,000, if expended, to be spent for salaries of teachers of agricultural subjects; $30,000, if expended, to be spent for salaries of teachers of home economics subjects; $30,000, if expended, to be spent for salaries of teachers of trade and industrial subjects; $15,000, if expended, to be spent for maintenance of teacher training, including supervision.
[57] $833 was for appropriations for Hawaii. The additional $50,000 was appropriated to provide the minimum for each State. $97,000 is authorized for this purpose. The apportionment is to be based on $1,097,000.
[58] Population of Territories, outlying possessions, and the District of Columbia not included in base.
[59] $841,000 is authorized for 1936 and 1937. Thereafter $1,938,000 is authorized.
[60] $5,000 is to be apportioned to Hawaii.
[61] $1,800,000 to be apportioned in proportion to live births; apportionment based on (*a*) quarterly State estimate of expenditures and (*b*) "such investigations as he may find necessary." Though the sec. 504 (a) (1), specifying the basis of the estimates refers to the previous sec. 502 (a), making lump-sum appropriations of $20,000 per State and providing for apportionment of $1,800,000 on the basis of live births, the evident intention is to refer to sec. 502 (b) providing for the allocation of $980,000 according to financial need.
[62] Secretary of Labor is to take into consideration the number of crippled children in State in need of services and cost of furnishing them. His estimate is to be based upon (*a*) quarterly State estimate of expenditures and (*b*) "such investigations as he may find necessary."
[63] Part of costs.
[64] $775,000 of this is for administrative expenses of Federal Government. Apportionment among States to be made on basis of $3,000,000.
[65] $4,000,000 is authorized for each fiscal year through 1938. 75 percent of the amounts appropriated is to be apportioned among States.
[66] The Federal Government matches appropriations made by States. The maximum is the amount allotted on the basis of population, from the Federal appropriation. As a minimum, a State must provide at least $5,000 or 25 percent of its allotted share of the Federal appropriation.
[67] Estimate based upon (*a*) population, (*b*) special health problems, and (*c*) financial need. Surgeon General is to hold a consultation with a conference of the State and Territorial health authorities.
[68] With approval of Secretary of the Treasury.
[69] $100,000 for grants to States and $90,000 for repair of vessels loaned to such schools.
[70] Apportioned among States and Territories.
[71] Nothing is said in the statute about States matching grants, but States do incur expenses for the National Guard, for armories, and for expenses of the guard when in State service.
[72] Emergency Relief Appropriation Act of 1935 appropriated a maximum of $4,880,000,000 to provide relief, work relief, and to increase employment by providing for useful projects. Amounts to be spent from this sum under provisions of the Federal Emergency Relief Act of 1933 were indefinite.
[73] Whenever Federal Emergency Relief Administrator finds that the combined moneys made available within a State will fall below the needs of the State for funds to furnish relief and work relief and relieving hardship and suffering caused by unemployment, he may make grants to that State.
[74] Extends to all States, Alaska, Canal Zone, District of Columbia, Puerto Rico, Hawaii, and Virgin Islands.
[75] $3,300,000,000 was appropriated on June 16, 1933 (48 U. S. Stat. 275), for Federal Emergency Administration of Public Works until June 30, 1935. This period was extended to June 30, 1937, by the Emergency Relief Appropriation Act of 1935 (49 U. S. Stat. 115). $400,000,000 of this sum was to be used for highways. See next entry in table for data. A minimum of $50,000,000 was for highways, roads, and trails in national forests, parks, Indian reservation, and public lands. The Emergency Relief Appropriation Act of 1935 continued these appropriations until June 30, 1937. In addition it appropriated a maximum of $4,880,000,000 to provide relief, work relief, and to increase employment by providing for useful projects. Of this sum a maximum of $800,000,000 was to be used for highways, roads, streets, and grade-crossing elimination and $900,000,000 was for loans or grants for public works projects.
The Emergency Relief Appropriation Act of 1936 (Public, No. 739, 74th Cong.) appropriated $1,425,000,000 to be used in the discretion and under the direction of the President, together with such unexpended balances of funds under Emergency Relief Appropriation Act of 1935 as the President may determine to continue to provide relief and work relief on useful projects. Among the specific purposes for which this appropriation is to be spent is highways, roads, and streets with an allotment of $413,250,000. No allocation formula is given for apportioning this sum. Not to exceed $300,000,000 is to be used for projects similar to those for which grants and loans were made to States and political subdivisions under N. I. R. A. and the Emergency Relief Appropriation Act of 1935. The maximum grant is 45 percent, but the P. W. A. is authorized to make loans to supplement outright grants.
[76] Funds are allocated by the Secretary of Agriculture.
[77] The $900,000,000 is available for loans or grants or both. Nothing specific is said about State matching.
[78] Under ch. 48, 49 U. S. Stat. 115, an additional $800,000,000 was appropriated to be available until June 30, 1937, for highways, roads, streets, and grade-crossing elimination and $900,000,000 for loans or grants for projects of States, Territories, possessions, including subdivisions and agencies thereof, municipalities and District of Columbia, and all self-liquidating projects of public bodies.
[79] This section does not include data on cooperation public health work and minor expenditures.
[80] Paid to county or counties in which refuge is located.

PART III—APPENDIX B
BRITISH GRANTS IN AID*

Historical

The grant-in-aid, or payment from the Exchequer of sums for the assistance of local units of government, has become in England, as elsewhere, both a necessary financial expedient and an instrument of public policy. Although there had been a grant to certain private institutions for educational purposes in the previous year, the grant-in-aid did not assume systematic form until 1834, when a parliamentary committee reported on the equity of the rating system. The committee found sufficient inequalities among local property valuations to justify the assumption by the central authority of at least part of the cost of administering criminal justice.

The idea seems to have been that the measure was a temporary one, pending some improvement in the rating system. Improvement, however, depended on improving the position of agriculture. Local inequalities in wealth became greater rather than less as the industrial revolution advanced, and to meet the changes the grant system has been steadily extended. Under Peel it became in effect a subsidy to agriculture: A means of reducing the farmer's rates to compensate him for the loss of his market. And still later the grant became the instrument for ensuring national minimum standards of efficiency in local governmental services.

The range of services subsidized by the central government depends on a nebulous distinction between "local" and "national" concern, with the tendency apparent to draw an increasing number of local functions under the latter category. A grant was given for education as far back as 1833, and was made permanent in 1839. In 1845 part of the burden of poor law administration was assumed by Whitehall; in 1856 the maintenance of local police became a matter of national interest, and in 1892 highways also were subsidized by the State.

By 1884-85 grants in aid from the central government had come to be nearly 7 percent of total local expenditure. The method of allocation, however, was haphazard, and in 1888 the entire question was formulated in a new local government act, which, with various modifications, remained in force until 1930. During this period the amount of the grant in aid increased from 3.6 million pounds in 1885 to 108 million pounds in 1930. Under the Local Government Act of 1929 the grant total jumped in 1931 to 130 million pounds, or almost 30 percent of the entire local government income, and the estimate for 1935 is more than 138 million pounds, compared with an estimated rate yield of 153 million pounds.

Grants in Aid Under the Local Government Act of 1929

Grants in aid to local units of government under the system now in operation fall under two main headings: (1) The general Exchequer contribution, made up of losses on account of rates and grants under the Derating Act of 1928, plus an additional sum of 5 million pounds, and certain variable supplementary and additional grants. (2) Substantive grants for education, police, housing, and certain classes of roads, which remained unchanged by the act of 1929, and are distributed on various bases combining the percentage, block, unit, and formula types. These two divisions of the general-grant fund will be exhibited in some detail below.

The Exchequer contribution, although ultimately to constitute a single fund to be allocated according to a weighted population formula, is for the present divided into two parts, the intention being to prevent a too radical upset in local finances as a result of the new system. This grant, which amounted in 1934-35 to approximately 45 million pounds, is figured on the basis of 1928-29 as a standard year, and is to be recalculated at designated intervals, or the expiration of each "fixed period." The first of these periods is of 3 years, 1930-33; the second of 4 years, 1933-37; and the succeeding periods of 5 years each.

For the first two fixed grant periods, or until April 1, 1937, 75 percent of the sum resulting from loss of rates and grants will be distributed in proportion to the amount lost, the remainder being allotted according to weighted population. For the next 5 years (1937-42) the percentage allocated in proportion to loss will be reduced to 50; for the following period (1942-47) to 25; and thereafter the entire sum due as compensation for loss of rates and grants will be distributed according to the weighted population formula given below.

THE FORMULA

(1) For each county and county borough a figure of weighted population is arrived at by increasing the population of the standard year as estimated by the registrar general:

(a) By the percentage by which, at the last previous census, the number of children under 5 years of age per 1,000 of the population of the area exceeded 50, and

(b) By the percentage by which, according to the valuation list in force on the 1st of October, 1929, or on subsequent revision, the ratable value per head of estimated population of the area is below 10 pounds.

The population so increased is further weighted:

(c) For unemployment; the number of unemployed insured men (plus 10 percent of the number of unemployed insured women) is expressed as a percentage of total estimated population, and where this percentage, averaged over 3 years, exceeds 1½ percent, the population increased by (a) and (b) is further increased by a percentage equal to ten times the excess over 1½ percent; and in administrative counties other than London.

(d) For low density of population, where the estimated population per mile of roads is less than 100 persons, the population increased by (a) and (b) is further increased by the percentage by which the estimated population per mile of roads is less than 200 persons, and, where the estimated population per mile of roads is 100 persons or more, by the percentage which 50 persons bears to the estimated population per mile of roads.

(2) The total amount of the formula grant allotted to each county will be x pence multiplied by its weighted population (the money factor x pence will be determined by the total sum for England and Wales available for distribution on the formula basis).[1]

Out of the total for each administrative county a grant goes to each noncounty borough and urban district council at a uniform figure per capita; and to each rural district council

* By Charles M. Wilcox

[1] Cmd. 3134 par. 23; and 19 and 20 Geo. V, c. 17, sched. 4, pt. III

at one-fifth of that per capita figure. This uniform figure per capita is one-half the amount obtained by dividing the total grant allotted to all administrative counties outside London by the aggregate actual population of these counties. The aggregate of grants to borough, urban, and rural district councils is deducted from the grant appropriate to the administrative county as a whole, and the balance is the sum payable to the county council in aid of the general county rate. In any county borough or administrative county as a whole, if the allotted grant does not exceed the aggregate loss of rates and grants in the standard year by a sum equal to 1 shilling a head, the allotted grant is increased by whatever sum may be necessary to bring the per capita gain to 1 shilling. Provision is also made for a special grant to any county whose actual rate poundage increases as a result of the scheme.

Derivation of the Grant Formula

The fourth schedule of the Local Government Act of 1929, containing this complex formula for computing grants, was referred to in debate by a member of the opposition as "the most important chapter of a very long bill." Sidney Webb had already observed, and the observation had gone unchallenged, that it was the longest bill ever introduced into Parliament.

And certainly the formula is important, for the bill is a wise and farsighted step toward centralization or mere political jugglery according to the soundness and accuracy of the formula. According to a command paper explaining the bill, the aim of the formula was so to adjust the revenue that assistance would vary with the need for local government services in relation to ability to pay. Factors selected to achieve this end were "a combination of population, the proportion to total population of children under 5 years of age, and the ratable value per head of population." This is the main framework, to which two special factors were added to take account of abnormal unemployment and of variations in local government costs due to population density.

Need rather than local expenditure is selected as the basis for aid, and interpreted to include relative ability to pay. Local expenditure is specifically rejected, because it is deemed to be the principle of the then existing system of aid, on which is placed the blame for the creation of necessitous areas. Population is the principal factor which governs need, and is hence the main basis of the formula. Lesser factors are relative wealth and poverty, which are taken account of in weighting for ratable value per head and for number of children under five. The argument runs that not only must the need created by the presence of a large number of children be considered, but that a larger proportion of children is found in the poorer districts. Ratable value per head alone would not give an accurate measure because of inequalities in valuation. The other two elements in the formula are to cover abnormal circumstances—heavy unemployment, and sparse or widely scattered population, which adds to the per-capita cost of governmental services.

The general argument against the bill is primarily directed at the derating proposals, and at the Government's motive in bringing the bill in just before elections. The Government ministers are more specific in their defense, the bulk of which is borne by Neville Chamberlain who, as Minister of Health, was coauthor of the bill with the Chancelor of the Exchequer, Winston Churchill. The motive for the formula is held by the Government to be the failure of percentage grants, which tend to attract most to those areas which can spend most. The formula under discussion is held to be, though admittedly imperfect, at least an attempt at scientific approach to the problem.

Taking the provisions of the formula in order, we come first to the population figure, weighted by "the percentage by which at the last previous census, the number of children under 5 years of age per 1,000 of the population of the area exceeded 50." The provision was attacked in committee on the ground that children under 5 are no drain on rates or health services in any except poor districts, and hence are not an accurate measure of need. Also the birth rates are uneven, so that children in the 1–5 group would be fewer than those in the 10–14 group. Neither is there a quick and accurate means of calculating the number of such children. The opposition proposes, therefore, to substitute number of children in public-school attendance.

The reply of the Minister is that the formula is not concerned with the actual burdens thrown on the community by the presence of children under 5. The children—"paper babies," the opposition calls them—are taken solely as a measure of relative wealth or poverty in a district. The age limit selected is admittedly arbitrary, but so would any other be. The Minister of Health then presents figures (later challenged) to show that if children under 14 or children in school were taken the result would be approximately the same. He then adds that the final choice of children under 5 was influenced by the following consideration:

> The number of children under 5 is a figure which cannot in any way be altered by any action on the part of the local authorities. The number of children at school age can be altered, and although I do not suggest that any local authority would take measures to attract a larger number into that particular class in order to weight its population and bring it a larger grant in the next fixed grant period yet it might be thought by some other ill-natured local authority or critic that such a thing was being done, and as the two figures are practically the same we felt it was better to take the figure of children under 5, which could not possibly be exposed to any such suggestion.[2]

The opposition points out that the Minister's objection would not apply if the basis were the number of children receiving free education in public elementary and secondary schools, because to increase that number would cost the local authority more than the additional grant would amount to. It would further be a known and definite number not dependent on estimates. However, no further notice of the objection is taken by the Minister.

The next clause in the formula provides that the population be weighted "by the percentage by which, according to the valuation list in force on the 1st of October 1929, or on subsequent revision, the ratable value per head of estimated population of the area is below 10 pounds." Sir K. Wood, parliamentary secretary to the Minister of Health, explains that the figure of 10 pounds is not a datum line, but has been chosen as being "near to the higher limit of the range of ratable value per head and so providing a loading in the great majority of cases." The figure would, of course, have to be changed if the average figure for ratable value in the country changed appreciably.

The next element in the formula is the weighting for unemployment. Opposition to this provision hinges chiefly on amount. The opponents of the bill charge that only between 1.2 and 1.5 millions from a block grant totaling 45 million pounds are to be distributed on the basis of unemployment, which they argue is a truer criterion of need than "paper babies" or ratable value per head. Opposition revisions would give 4 million pounds under this head.

[2] 224 H. C. Deb. 5 s, 1179.

It also charged as unjust to include only unemployed insured men, disregarding women. Hence the government amendment which became part of the schedule providing that 10 percent of the unemployed insured women be also considered. Argument on the amendment centers around 10 percent, the members for textile districts where large numbers of women ordinarily work, demanding equal weighting for women and men.

In his reply, the Minister cites examples of what the loading would be in several districts if unemployed insured men and women both counted, and finds that such figures show as more necessitous, districts known to be less so. He argues that the number of women with dependents who are receiving benefits under the Unemployment Insurance Act compared to the total number of unemployed insured women, is only one-fortieth of the corresponding proportion of men. This would indicate that equity would be served by adding to the figure for unemployed insured men 2.5 percent of that for unemployed insured women. However, Mr. Chamberlain concludes:

> Although, perhaps, that is as high as one should go on the actual figures, I do not think that is quite all we ought to take into account in considering the real equity of the case. Take a district where there is a large number of women ordinarily engaged in industry; there we must see that unemployment amongst those women tends to create a greater drop in the prosperity or the standard of that area than in the case where women are not ordinarily employed.[3]

This consideration leads the government to add to the figure for unemployed insured men 10 percent of the total number of unemployed insured women.

On the weighting of population by number of inhabitants per mile of road there is a brief discussion which the Minister waves aside, remarking that though other provisions were criticized from all angles, not one of the financial experts consulted by the Government had raised a question on that score.

The proportion between rural and urban districts by which the latter receive five times as much as the former is admittedly arbitrary, but Chamberlain argues that it has been worked out experimentally for various areas and found reasonably equitable. The urban districts have heavy charges for streets, sewerage, etc., as well as a share of the cost of roads in rural areas.

In general, the experimental method seems to have been the prevailing one throughout, the provisions of the formula being applied to various districts, and adjusted until the result was deemed satisfactory.

Substantive Grants

(1) *Education.*—Education grants are of three types, for aiding respectively elementary education, higher education, and industrial schools. Grants for the latter class of institution are virtually at the discretion of the home office. For higher education the earlier complicated system of allocation has been replaced by a single grant designed to reimburse local authorities up to 50 percent of approved expenditure. The elementary education grants, however, are less simple. Most important is the substantive grant, amounting to not less than 50 percent of approved net expenditure, and calculated according to the following formula:

(a) 45s. for each unit of average attendance in elementary schools (not including schools for blind, etc., children).

(b) 50 percent of the salaries of teachers, but not exceeding a standard.

(c) 50 percent of net expenditure in special services, including medical, provision of meals, physical training, play centers, nursery schools, and special schools.

(d) 20 percent of the remaining net expenditure on elementary education.

(e) From the sum of these four items is subtracted the product of a 7d. rate.

This generally amounts in practice to between 50 percent and 66⅔ percent of the local education authority's net expenditure.

Other grants for elementary education are the deficiency grant, dropped in 1931, and the highly rated area grant, provided when the rate for educational services reaches 3s. 3d. in the pound. The minimum rate and the amount of the grant itself are subject to revision on order issued in accord with the terms of the National Economy Act of 1931. Both of these grants were operative, however, in 1930-31, the year covered by the financial statement in table 7 (13) below.

(2) *Housing.*—Under the Housing Act of 1925 the Exchequer undertook to pay one-half of the annual net loss incurred in rehousing projects. By amendment of 1930, however,[4] the grant is provided to aid local authorities in slum clearance and housing improvement on the basis of the number of persons transferred to new accommodations, the rate being 45s. per person, payable for 40 years. For agricultural workers the grant includes an extra 5 shillings, or £2 10s. per head. Where rehousing requires building on sites worth more than £3,000 per acre, the grant became £3 10s.; and grants of £5 per house for 40 years may be made for small houses for the aged. The whole housing program is conditional on a contribution of £3 15s. per annum for 40 years from the local authorities.[5]

(3) *Police.*—The police grant amounts to 50 percent of net approved local expenditure, on certificate from the home secretary that an efficient police is established. Certification of expenditures is by the district auditor of the Ministry of Health.[6]

(4) *Roads.*—Roads are differentiated as class I, the main arteries on which heavy traffic flows; class II, the most important thoroughfares; and unclassified, covering all other roads. The grants in aid of roads come from the road fund, administered under the Ministry of Transport (Development and Road Improvement Funds) Act, 1909; and Ministry of Transport Act, 1919. Class I roads in administrative counties outside London receive 60 percent of the cost of maintenance and minor improvement, while class II roads in the same areas receive 50 percent. There is in addition a sum of 6.5 million pounds paid from the road fund into the general Exchequer contribution to local government, in lieu of sharing in the expenditure incurred in maintenance and minor improvement of classified roads in London, the county boroughs and the large boroughs of Scotland and of unclassified roads in all county areas.

(5) *Agriculture.*—The largest item under this head is the recoupment of losses incurred by small holdings authorities under the Small Holdings and Allotments Acts of 1908 and 1925, and 75 percent of the losses under the act of 1926. Other items are percentage grants for drainage, and to pay for animals slaughtered because of disease. The central authority also pays 75 percent of the capital expenditure in agricultural education and 66⅔ percent of the annual expenditure. In 1930 there were further grants from the development fund, created under the Development and Road Improvement Funds

[3] 224 H. C. Deb. 5 s. 1197–8

[4] 20 and 21 Geo. 5, c. 39.

[5] Housing Acts of 1923, 1924, 1925, 1930; Housing (Rural Workers) Acts of 1926 and 1931.

[6] Local Government Act of 1888 and Police Act of 1919.

Acts, 1909 and 1910, to the amount of 423,532 pounds. These, however, are probably not technically grants in aid of local revenues, but go to institutions and individuals. Under the Ministry of Transport Act of 1919 half the traveling expenses of engineers and surveyors to highway authorities are borne by the Exchequer (sec. 17 (2)); and under the Road Traffic Act of 1930 grants up to 60 percent may be made for traffic patrol or other form of traffic regulation.

(6) *Unemployment.*—An unemployment grants committee was appointed in 1920, with powers approved by the Treasury; and in 1929 it received statutory authorization under part II of the Development (Loan Guarantee and Grants) Act.[7] The committee ceased to exist in 1931, when the policy of making grants to local authorities "toward any expenditure to be incurred for the purpose of carrying out works of public utility calculated to promote employment in the United Kingdom" was substantially abandoned. During the 11 years of its existence the committee approved subsidies of 103 million pounds toward schemes the total cost of which, if completed, would have been 191 million pounds. Actual expenditures, however, were far short of this sum because many of the approved projects were never undertaken. Three general types of grant were distinguished:

(a) *Wage grants.*—Under this type of subsidy, the government undertook to pay a percentage of the wage bill on useful works undertaken by local authorities. The percentage was at first 30, then 60, and in 1924 was increased to 75 percent. In 1930, 90 percent of the wage bill for men put to work in areas where unemployment among adult males exceeded 15 percent was authorized to be paid by the Government. A total of 5 million pounds was allotted for wage grants before 1929, 99 percent of it by the end of 1925.

(b) *Loan grants.*—These were designed to carry by subsidy a substantial portion of the interest and sinking fund charges on approved undertakings, a distinction being made between revenue producing and nonrevenue producing schemes. In the latter case, including roads, sewers, etc., subsidies equivalent to 75 percent of interest and sinking-fund charges for the first half of the loan term but not to exceed 15 years was authorized; and on revenue producing projects 50 percent for the first 15 years. During the years 1921–28, 39 million pounds were allocated for eventual payment as loan grants.

(c) *Transference grants.*—The benefits of the loan grant were extended in 1928 to places of light unemployment, on condition that half of the workers employed on subsidized projects should be brought in from areas of heavier unemployment. The transference grant was abandoned in 1930, and all local authorities became eligible for loan grants under the old terms, with an additional 37½ percent of interest and sinking-fund charges for the second half of the loan period up to 15 years on nonrevenue producing works. Between 1929, when the committee was transferred to the Ministry of Labor, and 1931, works to an estimated cost of 78 million pounds were approved.

The bulk of the projects approved by the unemployment grants committee were of a nonrevenue producing nature, accounting for 113 million pounds out of the total of 190 millions. Sewers and sewage disposal projects make up 24 percent of the total and roads and footpaths 20 percent. The largest items among revenue producing schemes are electricity supply standardization, dock and harbor improvements, and water supply.

[7] 20 Geo. 5, c. 6.

TABLE 1.—*Projects authorized for grants by the unemployment grants committee, December 1920–January 1932* [1]

Period	Number of schemes	Total cost (1,000 pounds)
December 1920 to March 1922	3,523	25,574
March 1922 to June 1923	2,917	15,874
July 1923 to June 1924	2,780	24,222
July 1924 to June 1925	2,272	20,639
July 1925 to June 1926	1,240	17,566
July 1926 to June 1927	63	792
July 1927 to June 1928	28	319
July 1928 to June 10, 1929	352	6,181
June 11, 1929, to August 1929	147	1,665
September 1929 to August 1930	2,026	41,770
September 1930 to December 1931	2,274	35,234
January 1932	18	170
Total	17,640	[2] 191,006

[1] Final report of the unemployment grants committee.
[2] The revised estimate of Aug. 31, 1932, was 190,862,000.

TABLE 2.—*Public works authorized by the unemployment grants committee* [1]

[Figures in thousands of pounds]

Class of work	Nonrevenue	Revenue	Total	Percent of total
Sewers and sewage disposal	46,469		46,469	24.4
Roads and footpaths	39,316		39,316	20.6
Electricity supply standardization, etc.		24,498	24,498	12.8
Dock and harbor improvements and equipment		20,756	20,756	10.9
Water supply	5,523	14,854	20,377	10.7
Parks, recreation grounds, tennis courts, etc.	9,555	3,039	12,594	6.6
Tramways		5,330	5,330	2.8
Municipal buildings	3,907	160	4,067	2.1
Gas supply		3,803	3,803	2.0
Sea defense	2,559		2,559	1.3
Land reclamation and drainage	1,706		1,706	.9
River improvements	1,651		1,651	.9
Baths and washhouses		1,571	1,571	.8
Land development		1,444	1,444	.8
Various public health services not otherwise specified	1,199	217	1,416	.7
Miscellaneous	1,148	2,157	3,305	1.7
Total	113,033	77,829	190,862	100.0

[1] Final report of the unemployment grants committee.

Other unemployment grants are administered by the Ministries of Transport, Agriculture, and Health.

Financial Statement of the Grant Year 1932–33

In the fiscal year ending March 31, 1933, the Government gave out to local authorities in England and Wales, in the form of grants in aid, the total sum of 120,531,716 pounds, not including some 4 million pounds capital grant. The total block grant, allocated partly according to the formula given above and partly in proportion to loss of rates, was 43,921,909 pounds; and there was another sum of 1,047,013 pounds not allocated to specific purposes. Detailed statements will be found in the accompanying tables.

TABLE 3.—*British grants in aid for the fiscal year 1932–33*

Total substantive grants, including grants from the road fund	£74,939,783
Total block-formula grant	43,921,909
Additional unallocated grant	1,047,013
Grant for trading services and corporation estates	623,011
Total	120,531,716

TABLE 4.—*Substantive grants for 1932–33* [1]

Service	Total, annual expenditure	Total, Government grant
Education:		
Elementary education	£62,470,711	£30,568,251
Higher education	20,108,076	8,204,123
Total, education	82,578,787	38,772,446
Housing:		
1. Assisted housing schemes under act of 1919	13,548,724	6,600,747
2. Other State-aided housing schemes	23,630,209	6,128,118
3. Other housing schemes	1,819,832	1,890
Total, housing	38,998,855	12,730,755
Highways and bridges	46,758,990	8,923,052
Police and police stations	21,537,707	10,067,842
Public health	46,051,505	1,543,942
Agriculture, including allotments and drainage	3,954,800	1,037,898
Other services	80,943,230	434,258
Total	320,823,874	73,510,193

[1] Based on Ministry of Health Report, 1934–35, appendix XVII.

TABLE 5.—*Estimated exchequer grants for second fixed grant period*

Losses on account of rates (sec. 86 (3) (a))	£22,292,203
Losses on account of grants (sec. 86 (3) (b))	16,279,706
Total losses on account of rates and grants, of which 75 percent, or £28,928,932, is distributed in proportion to loss	38,571,909
Additional money (sec. 86 (3) (c))	5,350,000
Total annual exchequer contribution	43,921,909
Additional and supplementary sums to guarantee against loss in revenue under this act; under secs. 90, 96, and 99, and under proviso to sec. 89	[1]462,781
Under secs. 94, 97, and 100	1,028,693
Total	45,413,383

[1] Provisionally calculated.

TABLE 6.—*Government grants for England and Wales under the Local Government Act of 1929, first and second grant periods*

Year	75 percent of losses on account of rates and grants	County apportionment	Additional exchequer grant [1]	Total block grant
	Pounds	*Pounds*	*Pounds*	*Pounds*
1932–33 (last year of first fixed grant period)	28,928,932	43,579,175	515,334	44,094,509
1933–34 (estimated)	28,928,932	43,921,909	[2] 434,999	44,356,908

[1] Including special grant under proviso to sec. 89 of the Local Government Act to make up any deficit where county apportionment is insufficient to cover disbursements to county district councils.
[2] Provisionally calculated.

Central Control Over Local Activity

One of the most powerful arguments for the extension of the system of grants in aid has consistently been the argument that it places in the hands of the central authority a means of controlling the activities of the local units of government, as well as giving in many instances a check on local expenditures. These controls are of a direct and bureaucratic nature, and are perhaps at once more effective and more dangerous for their having been left largely to the discretion of some administrative officer.

As regards the Local Government Act of 1929, there is a general power granted in the act (sec. 108) enabling the minister charged with its administration to make such regulations for carrying the act into effect as he may see fit. And, further, the share of the Exchequer block grant allocated to any given unit may be withheld if in the opinion of the minister that unit has failed to maintain a reasonable standard of efficiency in its public health services or its highway maintenance (sec. 104). This provision is subject to the salutary qualification, however, that the minister must lay before Parliament his reasons for reducing or withholding the grants.

Wholly aside from grants in aid, the annual audit by central authorities of the accounts of all counties, urban and rural districts, and parishes gives considerable financial control. In the matter of education and housing accounts, the audit extends also to county and noncounty boroughs.[3] The district auditor has power to surcharge unauthorized entries, a provision of considerable weight in insuring rectitude on the part of local officials. The audit is also taken into account in considering applications for grants.

In the realm of education, the Board of Education is empowered by the Education Act of 1921 to draw up regulations as to efficiency, standards, inspections, etc., and may withhold recognition (for purposes of receiving a grant) from any school which fails to meet them. The authority of the Board is practically unlimited in matters of school administration, and it maintains its own corps of inspectors to see that administrative requirements are adhered to.

Similarly, the Ministry of Transport must be satisfied that the road policy to be pursued with the aid of public funds is both locally and nationally beneficial, and these conditions must be attested, just as plans must be approved, by road divisional engineers attached to the ministry. Standards of public health have already been referred to. In respect to housing, local authorities are practically forced to proceed under the Housing Act of 1930. It is required that an inspection be made and a report submitted to the Minister, with proposals for clearances or improvement, both the inspection and the proposals being subject to review. The Minister may order a public inquiry on complaint of any individual or group that a local authority

[3] See Public Health Act, 1875, 38 and 39 Vict. c. 55, secs. 245–250; Education Act 1921, secs. 123 ff.; Housing Act 1949, sec. 7 and subsequest orders and statutes; Local Government Act 1929, sec. 17.

is in default of its obligations to provide adequate housing for the working classes.[9]

The public grant is also dependent upon certification of efficiency by the district auditor of the Ministry of Health. Inspection annually by regular police inspectors includes a check of personnel, equipment, records, numbers, and of jails and station houses. The home office has virtually unlimited authority to fix standards and to enforce them by inspection and threat to withhold the grant.

Because the grants in aid from the exchequer form so large a portion of local revenues, the central government can by mere threat to withhold the grants, effectively force compliance with whatever reasonable standards it may set.

TABLE 7.—*Principal sources of income*

A. NATIONAL GOVERNMENT—EXCHEQUER RECEIPTS, 1934–35

Income tax	£228, 877, 000
Excise	104, 600, 000
Customs	185, 096, 000
Estate, etc., duties	81, 356, 000
Surtax	51, 165, 000
Motor vehicle duties	5, 100, 000
Stamp duties	24, 110, 000
All other taxes	1, 258, 000
Non-taxation revenue (postal and telegraph service, etc.)	33, 067, 000
Total	804, 629, 000

B. LOCAL GOVERNMENT—ENGLAND AND WALES, 1930–31 [1]

Public rates	£149, 895, 968
Government grants	[2] 130, 158, 587
Fees, rents, repayments, etc	49, 285, 517
Other sources (trading services, etc.)	119, 792, 369
Total	449, 132, 441

[1] Later figures not available.

[2] Exclusive of 7 million pounds capital grant.

[9] 20 and 21 Geo. 5 c. 39.

TABLE 8.—*Comparison between National Government income and grants in aid, 1880–1935*

Fiscal year	National Government income	Grants in aid	Percentage
1880	£70, 357, 079	£2, 858, 955	4. 1
1890	89, 416, 136	6, 522, 279	7. 3
1900	119, 839, 905	12, 249, 083	10. 2
1910	131, 696, 457	20, 914, 877	15. 9
1920	1, 339, 571, 381	48, 263, 446	3. 6
1921	1, 425, 984, 666	63, 040, 998	4. 4
1922	1, 124, 880, 000	76, 663, 078	6. 8
1923	914, 012, 452	75, 843, 058	8. 3
1924	837, 169, 284	78, 324, 525	9. 4
1925	799, 435, 595	81, 741, 763	10. 2
1926	812, 061, 658	84, 634, 809	10. 4
1927	805, 701, 234	86, 960, 350	10. 8
1928	842, 824, 465	90, 084, 348	10. 7
1929	836, 434, 988	92, 283, 039	11. 0
1930	814, 971, 280	107, 828, 339	13. 2
1931	857, 760, 934	130, 158, 587	15. 2
1932	851, 482, 281	126, 549, 780	14. 9
1933	827, 031, 000	120, 531, 716	14. 6
1934	809, 379, 149	[1] 132, 152, 000	16. 3
1935	804, 629, 050	[1] 138, 438, 000	17. 2

[1] Estimated.

TABLE 9.—*Comparison between local government income and grants in aid, 1880–1932*

Fiscal year	Local government income [1]	Grants in aid	Percentage
1880	£39, 524, 802	£2, 858, 955	7. 2
1890	50, 237, 862	6, 522, 279	13. 0
1900	77, 202, 175	12, 249, 083	15. 9
1910	126, 908, 622	20, 914, 877	16. 5
1920	257, 917, 240	48, 263, 446	18. 7
1921	341, 153, 709	63, 040, 998	18. 5
1922	374, 467, 838	76, 663, 078	20. 5
1923	361, 117, 257	75, 843, 058	21. 0
1924	349, 432, 271	78, 324, 525	22. 4
1925	354, 839, 665	81, 741, 763	23. 0
1926	372, 150, 451	84, 634, 809	22. 7
1927	395, 760, 229	86, 960, 350	22. 0
1928	416, 029, 404	90, 084, 348	21. 7
1929	423, 585, 088	92, 283, 039	21. 8
1930	428, 641, 843	107, 828, 339	25. 2
1931	449, 132, 441	130, 158, 587	29. 0
1932	446, 759, 553	126, 549, 780	28. 3

[1] Excluding loans.